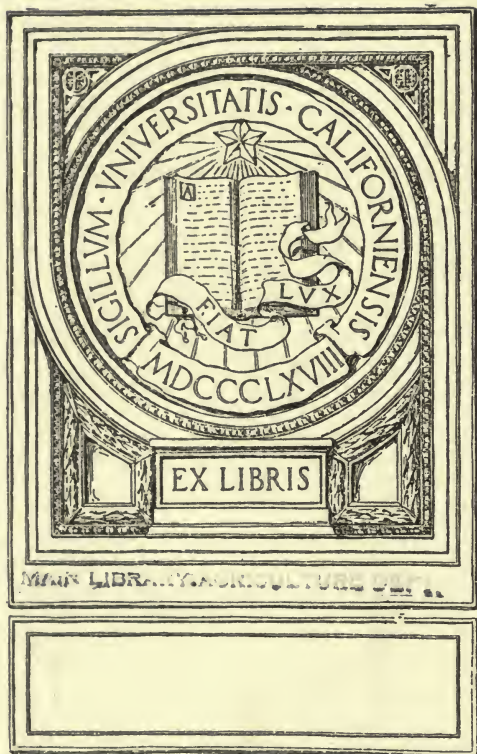






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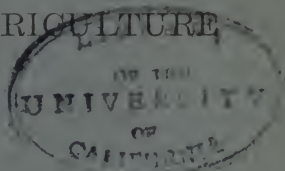


EXCHANGE

JAN 18 1921

PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF AGRICULTURE



CLEARING BUSH LANDS IN B.C.

BULLETIN No. 85



PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C. :

Printed by WILLIAM H. COLLIN, Printer to the King's Most Excellent Majesty.
1920.

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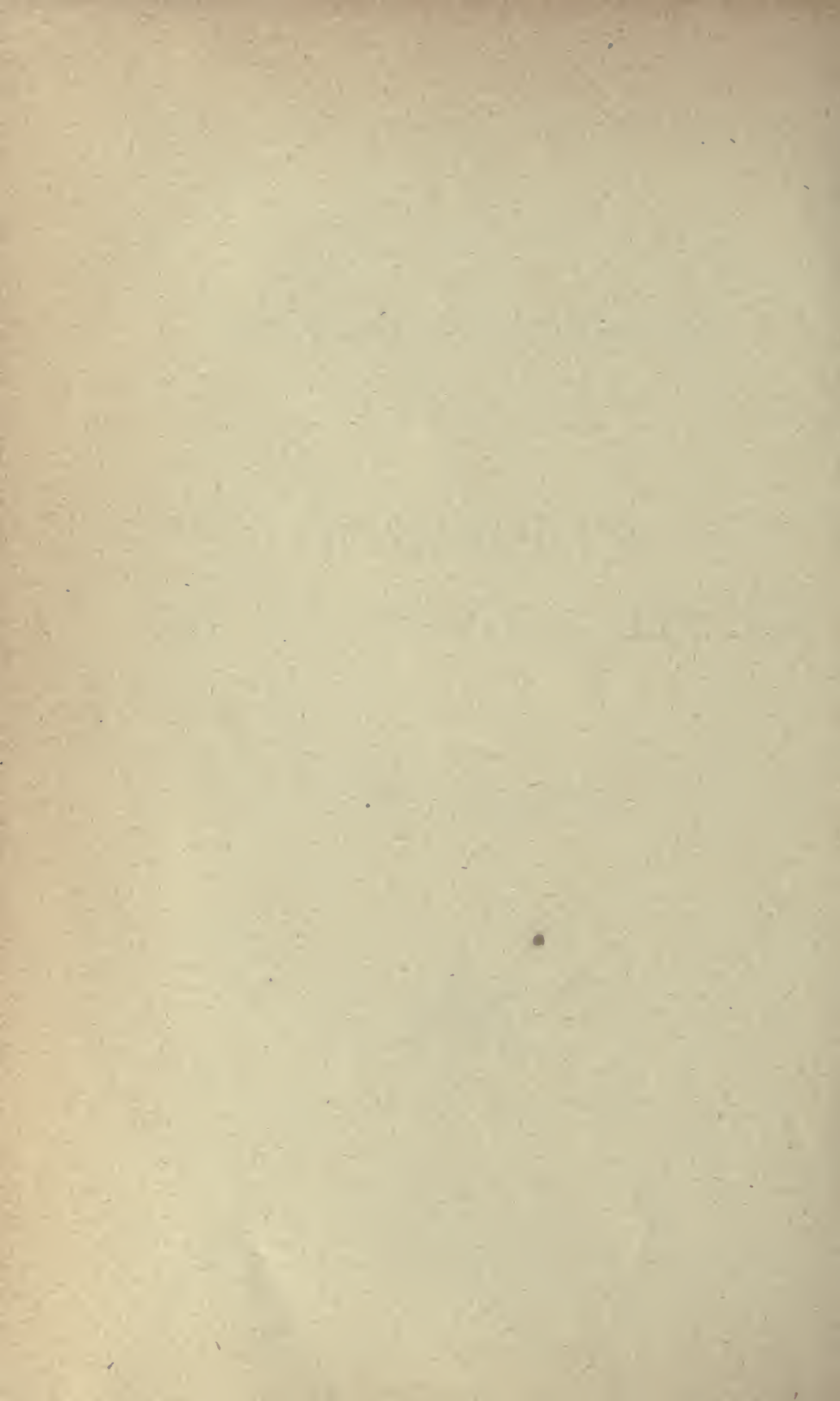
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FOREWORD.

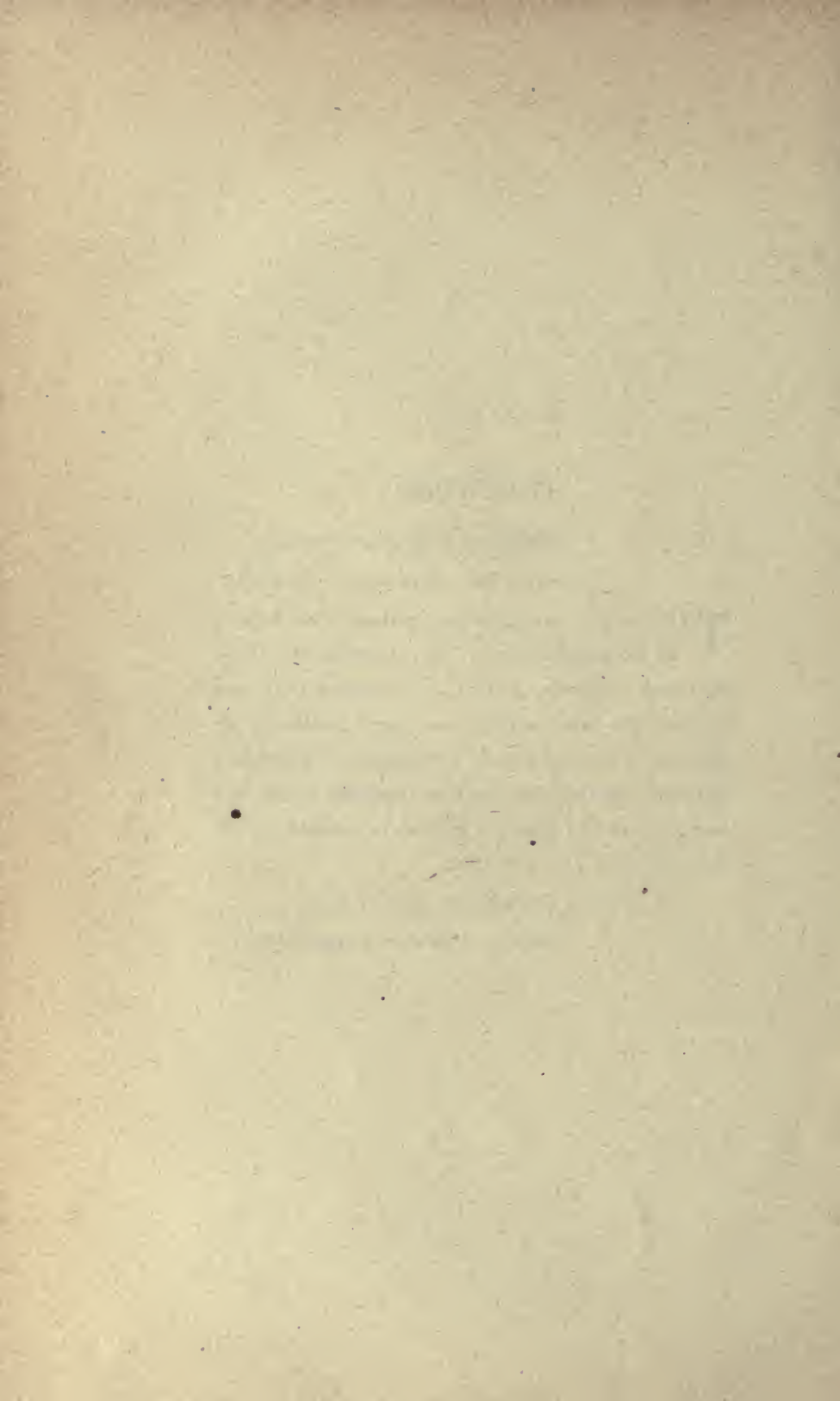
DEPARTMENT OF AGRICULTURE,

VICTORIA, B.C., September 9th, 1920.

THIS bulletin has again been revised at the request of the Department of Agriculture by its author, Mr. Chas. E. Hope, B.C.L.S., of Langley Fort, and as this, the third edition, has been practically rewritten to meet changing conditions, it is believed that the practical information conveyed herein will be found of the greatest service to settlers on the bush lands of this Province.

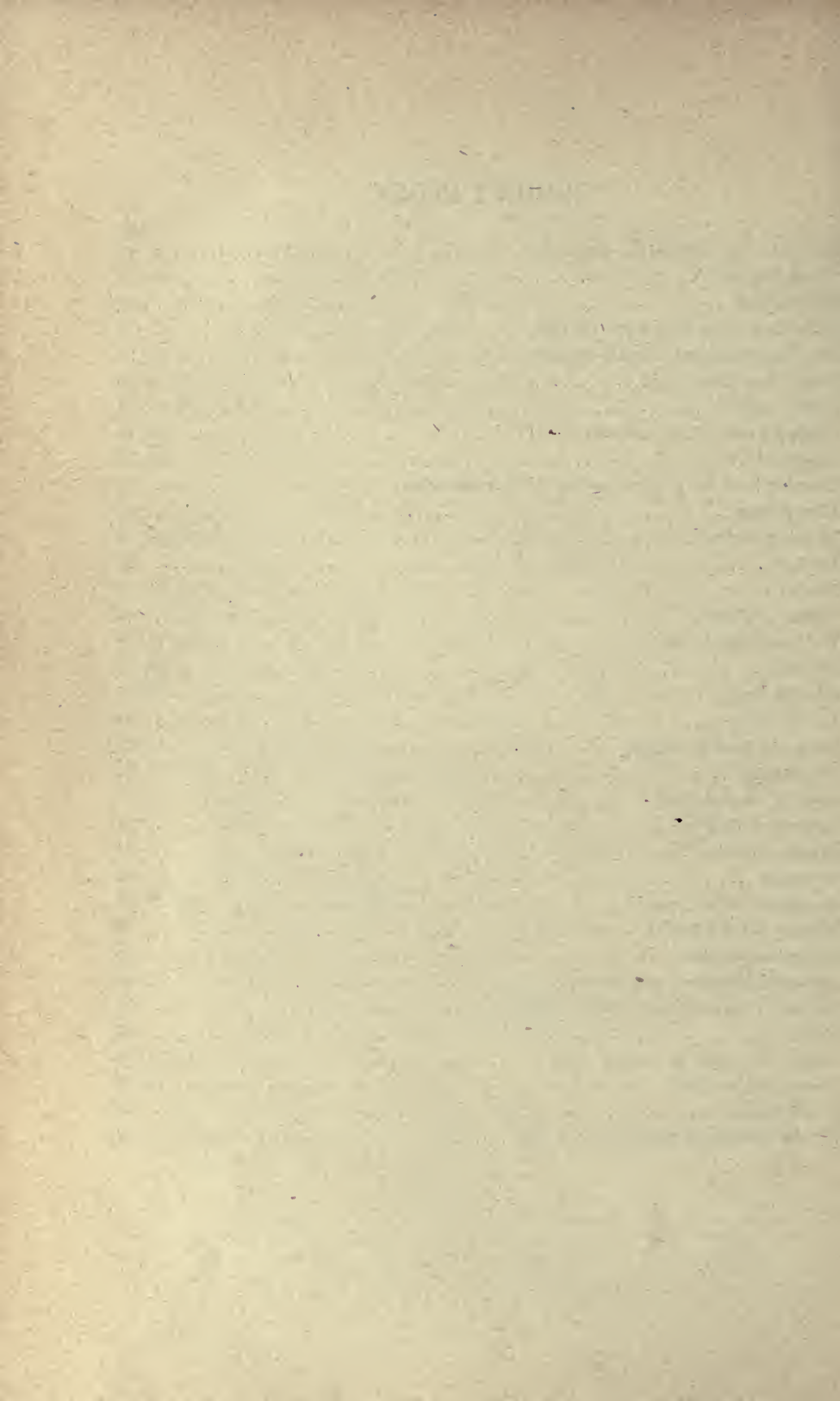
DAVID WARNOCK, V.S., O.B.E.,

Deputy Minister of Agriculture.

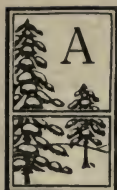


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AUTHOR'S PREFACE TO THIRD EDITION.



AT THE time the first edition was printed there was a strong movement towards taking up bush lands. Most of the settlers entering upon this work were largely inexperienced and there were no handbooks or pamphlets to guide them. There is again a wave of immigration sweeping over this Province, and again it is largely a question of the clearing of these bush lands; and, while there are many opportunities for newcomers to learn the various kinds of farming, either through the British Columbia University or in the different public institutions, through the Soldier Settlement Board and Civil Re-establishment Departments, there is no course so far being undertaken by any of them having any relation to the clearing of land. As most farming operations in this Province have to commence with land-clearing, the writer feels that this apparent oversight is much to be regretted. While the different processes of land-clearing described in this and the two previous editions will apply generally to almost all parts of British Columbia where there is bush to clear, it applies more particularly, perhaps, to the Lower Fraser Valley, Vancouver Island, and the Coast Districts.

Since the second edition was printed many changes have taken place throughout the Province, and perhaps these changes have been greater and more far-reaching in the Lower Fraser Valley than anywhere else. At the time this third edition is being written wages and costs of lumber and other materials, but particularly lumber—to say nothing of the cost of living—have increased enormously, and it can fairly be said that they are now quite abnormal. As time goes on there will, no doubt, be some adjustment downwards, but when this will come or to what extent it is not safe to prophesy, so this pamphlet has been rewritten, basing it largely upon present-day conditions. When the second edition was written the average rate of wages in any land-clearing activities was not over \$2.50 per day of ten hours, and sometimes it was less. To-day it is from \$4.50 to \$5 for ten hours, and sometimes even more. Rough merchantable lumber and shiplap were selling at from \$8 to \$12 per 1,000 feet. To-day they run from \$30 to \$45, and everything else is in proportion.

Cost, of course, enters very largely into the question of clearing and cannot be ignored, but the underlying principles of bush-land improvement are still the same, although new and improved methods have been developed. If one could be certain that the present prices of farm produce would continue indefinitely, it might be safe to figure the present cost of clearing as being in proportion; but it cannot be doubted that as time goes on many of the articles produced on the farm will drop in price, so that to estimate the value of clearing based upon present costs would give a capital value to land when cleared probably in excess of what it would be able to pay a reasonable rate of interest on when the price of produce comes back to somewhere near what it was before. The best authorities say that farm produce will never come back to quite its old level, but the probabilities are that wages and other costs will not do so either. It would, however, be unwise for any one clearing land to figure his wages at present rates. A man is always willing to work for himself at a little less than what he will work for any one else, and, no matter what happens to produce prices or wages in the future, the man who has cleared his own land has always got the satisfaction of knowing that he did it, "not George," and that the man who is going to get the benefit of the clearing will be himself. As a slight offset to this increased cost of clearing, unimproved land can be obtained in most places for a great deal less than was asked for it prior to the war.

Since the second edition was written, also, great changes in other directions have taken place in the Province. Many hundreds of thousands of acres formerly

beyond the reach of settlement, owing to lack of transportation facilities, have been made available by the building of new railways. In the Lower Fraser Valley the conditions have, perhaps, changed even more than elsewhere. At least three new lines of railway have been built throughout the length of the valley—the British Columbia Electric, the Canadian National, and the Great Northern—bringing within easy reach of transportation practically every part of the Lower Fraser Valley. But perhaps the greatest change has been the cutting-down and utilization of the standing timber. Twelve years ago a very large portion of the valley was covered with a dense growth of, in many places, heavy merchantable timber. This has been almost all logged off. In another two years or so it will probably all have gone; and not only the merchantable timber, but large areas of smaller growth, which twelve years ago was not considered to have any value. This has been used for railway-ties and for logs by small sawmills, with the result that there are to-day thousands of acres of logged-off lands available for settlement, and the valley as a whole has had one stage of the clearing completed without any effort on the part of the land-owners. This makes the final clearing not only an easier but also a shorter operation, as immediately the trees are cut the stumps begin to rot.

Two other changes have taken place in this valley. One is the great extension of co-operation, in both buying and selling, among the farmers. This tends to stabilize prices and cheaper production. The other is the very large extension of the small-fruit industry. Twelve or fifteen years ago there was, comparatively, a very small acreage in berries; the future looked doubtful and the profits were small—some years there were none. There are to-day large areas in strawberries, raspberries, loganberries, blackberries, etc., and these areas are being greatly extended. The profits are so large and the demand so great that it undoubtedly pays in some cases to clear land as an investment alone, even allowing for the present abnormal prices of everything.

CHAS. E. HOPE.

Deep Creek Farm,

Langley Fort, B.C., June, 1920.



Spring. The noon hour.



Clearing with donkey-engine at Camp Lister, near Creston, B.C. (Courtesy of Land Settlement Board.)

CLEARING BUSH LANDS IN BRITISH COLUMBIA.



IN the Lower Fraser Valley and Coast Districts of British Columbia there is practically no naturally clear, open land except lands which flood every year, and which are usually covered with a rank growth of grass (either broad-leaved swamp-grass, blue-joint, or red-top), or consist of swamps more or less peaty in character, requiring ditching and underdraining, and often also some light clearing. Land which does not flood and is not swampy is invariably timbered, the timber being scattered first-growth fir and cedar 3 to 5 feet in diameter, groves of second-growth fir 12 to 24 inches in diameter, mixed all through with alder, maple, cherry, birch, and crab-apple, with patches of vine-maple, willow and hazel, berry-bushes, rose-bushes, and hardhack (in the wet places), with occasional fir and cedar logs scattered through the whole, at first sight presenting a pretty hard-looking tangle. This represents in a general way the average character of the timbered land of the Lower Fraser Valley and Coast Districts, none of which requires irrigation.

In the Interior districts are large areas of open range land covered with bunch and other similar nutritious grasses and almost invariably requiring irrigation. There are also large areas timbered, almost entirely with the coniferous woods, chiefly fir and pine, with no underbrush, the trees being fairly large, from 2 to 4 feet in diameter. Some of this land requires irrigation, although there are portions of it which will produce grain and other crops with the natural moisture. There are also in most of the Interior districts patches of bottom land timbered with small willow, cottonwood, etc., and with very few large trees, which do not require irrigation.

The various clearing operations described herein will apply to any of the timbered districts of the Province, although they are written more particularly with reference to the Coast and Lower Fraser Valley Districts and to those parts of the Province lying to the west of the Cascade Mountains, as these districts are the ones wherein the clearing problem assumes most prominence.

It should, however, be distinctly understood that the operations described are not intended to apply to timbered lands which would come under the head of timber limits, as the timber on such lands could not be cleared off for farming at any price which would make it commercially profitable, even if the character of the land when cleared was suitable for farming, which, often, it is not.

The character of the soil of the average timbered uplands of the Lower Fraser Valley and Coast Districts is a good clay loam, free from gravel or stones except perhaps in odd spots, no rock, more or less rolling as to surface, with wet bottoms and occasional creeks running through. There is, however, a great variety of soil in this district, running all the way from a heavy alluvial clay to a light sandy or gravelly loam. The soil in the Interior valleys varies also very greatly in different districts, and soil suitable for almost any kind of crop desired can be obtained.

WHEN AND HOW TO BEGIN.

The settler intending to take up and clear bush land in this Province should arrive here between March 1st and June 1st, as after the latter date there is no time to do more than one month's chopping before the burning season begins, and although chopping, or slashing, as it is commonly called, can be done at any time of the year even before April 1st, it is not advisable. Arriving here in March leaves the new-comer a month in which to select his land, as the sap in the deciduous trees has not commenced to run, and trees of this class, such as vine-maple, willow, hazel, and, to some extent, also alder, will sprout much stronger if cut when the

sap is down than when it is running freely, or when the tree or bush is in full leaf. Probably the best time for chopping is from the middle of May to the middle of July, as the trees, being in full leaf, burn easily and clean, and the windrows, or brush-heaps, have ample time to dry out before the burning season. Fir, cedar, and the other coniferous trees can be cut any time and they will not sprout, and as the leaves or needles are green the year round there is always enough small dried foliage to ensure a clean burn.

The best time to cut willow and small brush in wet swamps is in October or early in November, just after or just before the leaves fall. They should be cut very close to the ground and piled closely. They will not burn the year they are cut, but will burn well the following spring. These trees are difficult to kill out unless cut at a time of the year when all the sap is out of the root and before it



Typical bush land. Lower Fraser Valley.

has begun to run back from the leaves into the root. It has been found from many experiments that cutting them at this time of the year kills a great many of the roots, and if the burning is left until about May, by which time any roots which are not dead will have sprouted, the fire almost always finishes them. The same thing would apply to almost any other kind of deciduous trees, but the period during which this chopping or slashing can be done to advantage in the fall is very limited—probably not over a month—which would make the chopping season very short, besides which it cannot be burned until spring.

I cannot too strongly emphasize the vital importance in land-clearing of only doing just that kind of work which is most suitable for the particular time of the year; more time, money, and labour have been wasted in clearing land from not carefully studying this question than from any other cause. Another very important thing is always to follow the regular rotation of the different operations of land-clearing—as a proper rotation of crops is essential to successful farming, so is it equally important in successful land-clearing to observe a proper rotation of the different clearing operations. This will be explained in greater detail later on.

Another important factor in clearing land is never to chop and burn more bush in one year than you can afford to pick and "brand up"* the following fall or winter, or at least before you chop any more.

The above paragraph on chopping, as well as some of the following ones, would not apply to a great deal of the Lower Fraser Valley, which has already been logged and burned over. If there is any bush coming up at all on these recently logged-over lands, it would be mostly very small alder seedlings, berry-bushes, etc. It is not advisable to chop these at all. They should be grubbed up or ploughed out. It is very difficult to kill them by chopping alone if they are less than 1½ inches in diameter. This land should be seeded down as soon as possible, even before the grubbing is done, in order to keep down ferns and encourage the pasturing of cattle and sheep.

GOLDEN RULES.

These three rules are the foundation upon which cheap clearing is built, and should be carved above the doorway of every settler's cabin in a bush country. To put them briefly:—

- 1st. Always do that kind of work most suitable to the season of the year.
- 2nd. Follow a regular rotation in all clearing operations.
- 3rd. Never chop in one year more than you can brand up before the next chopping season comes round.

One great advantage in following these rules is that it gives variety to the work and it never gets monotonous. Given well-chosen land, it is safe to say that by strictly following the above three rules the cost of land-clearing can be reduced to one-third of what it will cost by disregarding them. In fact, a man entirely unused to land-clearing, who uses his head as well as his arms, will clear land cheaper than the man born with an axe in his hand, who only uses the hand and the axe.

As to tools: All that is wanted the first year is a double-bitted axe if you know how to use one, or a single-bitted one if you are only learning (get a light axe with a blade not too wide and wrap some light fence-wire around the handle close to the head—this saves many a broken handle). If there is no clearing on your place to start with, buy a small-sized wall-tent and about 150 superficial feet of 1-x 12-inch boards for your camp. Set up your tent on the south or east of your land (as that is the side you should start to chop first), and on the roadside not too far from water. Always start to clear, if possible, on the south side of your land first. This does not make very much difference the first year, but it makes a big difference every year afterwards, because after you have got a clearing once made your subsequent clearings dry out quicker if they are open to the south.

The first thing to be considered is what should be chopped first; to chop down the whole bush, big and little, is a heavy task, a slow one, and nearly always spoils the clearing. The object should be to burn as little timber as possible, as the larger trees are valuable, or will be in the near future, at least to the extent of paying to take them away; therefore, leave all the first-growth fir and cedar (the standing tree takes up no more room than the stump will occupy after the tree is chopped down, and in a very short time timber of this character will not only pay to remove, but give a profit sufficient to pay for taking out the stump). Another reason for leaving these big trees is that they are coniferous trees (that is, fir, cedar, and hemlock), and if you burn them on the ground the fire is so hot that you burn the vegetable humus out of the soil and get none of the fertilizing ashes left by deciduous trees to take its place. Still another advantage of leaving the very big trees is that when all the other timber is burnt off they are more exposed to the wind, and often during the winter they will blow over and bring up the stump, thus saving the cost of stumping later on.

* "Brand up," to gather together into heaps the charred or partly burned sticks, small logs, branches, etc., left after burning.

In chopping this kind of bush the time of the year should be considered; the best time to burn is about the middle of August; good fires are sometimes got a month earlier or a month later, but August 15th is a fair average. During a dry summer bush will burn two weeks after it is chopped (that is if it is well piled), so it is a good plan to have all your chopping finished by August 1st if possible, or even a little earlier. Alder is almost the only deciduous tree which can be chopped when the sap is down and the leaves are off (that is in winter) without much danger of its sprouting, so that it is better not to start chopping until about April 1st, by which time the trees are all bursting into leaf; the more leaves there are when the trees are cut the better will be the fire, and remember that a good burn is the biggest half of the battle. If the brush is well piled and burnt at the right time, the fire ought to sweep completely over the ground and burn everything up clean (except a few of the bigger tree-trunks), leaving the ground quite bare except for a fine covering of ashes. It is better to chop only 5 acres and pile everything up thoroughly than chop 10 acres and do it carelessly, as the work of branding-up after the fire in the former case is trifling, but if a good burn is not obtained the picking-up is sometimes a big business.

If the chopping is done by contract instead of personally, it always pays to give a dollar or two an acre more and get an A1 job than get it done cheaply and badly piled. Spend a dollar extra in money or time on the chopping and piling and save two dollars on the picking-up.

ADVICE AS TO CHOPPING.

Here are a few hints as to chopping:—

Pile the brush and trees in continuous rows (called windrows), not in heaps, and if there is standing timber on the south side of the clearing, as there probably will be the first year, let the windrows start at the standing timber and run north for about eight rods or thereabouts. Do not build a pile parallel to the standing timber, as it will never dry out properly. When there is once an opening to the south of the clearing it is better to let the piles run east and west, as they dry out better.

Do not pile any brush on logs; leave the fallen logs clear, for a cedar log would probably burn up, and all the cedar logs are wanted for fencing, draining and buildings, and a fir log is prevented from drying out if brush is piled upon it, and, more important still, brush piled over a big log leaves a hollow alongside the log under the brush, and the brush does not burn well.

All deciduous trees (and particularly hazel, vine-maple, and willow) 3 inches in diameter or less should be cut right into the ground. The reason for this is that they are sure to sprout more or less the following spring, and if there is 6 or 8 inches of a sharp stump sticking up the cattle cannot browse on the young shoots, but if cut into the ground the cattle will keep the shoots trimmed down and they will nearly all be killed out by the following fall. Fir, cedar, or hemlock seedlings need not be cut so close, as they do not sprout; in fact, it is better to leave them 6 or 8 inches long, as they are more readily knocked out by the cattle tramping among them. Anything above 3 inches diameter should be cut "stump-high," about 2½ feet. Do not cut anything above 10 inches in diameter (as above that thickness will make good cordwood or railway-ties), except alder or maple, which should be cut along with the brush. If you are going to live on the place it is a good plan to limb the trunks of the larger alders and maples, cut them in convenient lengths, and instead of piling them on the brush-pile leave them on the ground between the piles, and when the chopping is finished and before you start to burn haul these logs out of the way, cut them into 4-foot lengths, and split them for cordwood for your own use. They should not be allowed to lie on the ground all summer without splitting, or they will be dozy by the fall.

It is a good plan to leave a few of the larger trees that are to be burnt until the last, and then chop them so that they will fall lengthways over your brush-piles.

This compacts the piles and leaves the larger trees on the top, where they have the best chance to dry out and burn, but be careful not to leave them lying *across* the piles, and always limb them and cut them into two or three lengths, so that they lie close and snug.

Do not chop anything after August 1st at the latest, except willows, etc., in October, but a week or two before burning take a light scythe and mow the ferns, which will probably have sprung up between the brush-piles. These dry out in a few days and help the fires to run. The clearing will now be in first-class order for a good burn.

WHEN TO BURN.

In writing these notes on land-clearing I am assuming that the settler is devoting most of his time to his clearing, and am giving him the best times to do each kind of work, but the only time which is absolutely essential to keep to is



Chopped and burnt. Ready to "seed down" and "brand up."

the burning, which must be done about the latter half of August if at all possible. If the settler wants to work out he can do his chopping any time between March 1st and August 1st, and unless he intends to work on his place all winter he will probably find that he will chop in two or two and one-half months as much as he can conveniently finish up the following winter. The average man on the average bush land should chop and pile 10 to 15 acres in that time, which will give him a first-class start the following year in either poultry or small fruits, or even dairying in a small way, though it would hardly be advisable to try to stump and plough more than 4 or 5 acres for two or even three years after. By that time, if he continues this course, he will have made a very big hole in the bush of his 20- or 40-acre farm.

When the proper time to burn arrives the greatest care should be exercised to prevent the fires running over adjoining property, no matter whether there is merchantable timber or not. Millions of dollars are lost on this continent every year

through careless burning. Timber that has taken hundreds of years to grow is destroyed in a day, and the standing timber, in British Columbia particularly, is one of our greatest assets. If proper care is exercised, however, there is no reason why fire should ever run past the clearing. Unless the settler is experienced in this kind of work it is just as well to have a friend or neighbour for the day while it is being done. There is no trouble at all in burning 10 or 15 acres in one day. Do not be deceived on a very calm day with the idea that there is no wind. A bush fire seems to make its own wind and you never can tell where it is going to go. If there is a very slight wind it is always best to start burning on that side of the clearing towards which the wind is blowing, and be very careful that it does not spread past the boundary of the clearing. This will result in burning up the brush-piles on that boundary before the fires get very large, leaving a strip of burned-over ground across which the flames would have to jump before they could get past the boundaries of your chopping. This is known as back-firing. If there is apparently



Chopped and burning.

no wind it is generally best to start and burn on the side next to the uncleared bush, for the same reason—that it leaves a burned-over strip as a protection to what is not chopped, whether the latter is your own land or somebody else's.

A ground fire running through unchopped timber may be a considerable help in chopping later or it may be a great detriment; it depends so much on the kind of timber and other conditions, and it is just as well to avoid having a fire in any case, as one never knows how far it will go or what damage it will do. It is really better not to burn at all if the day is at all windy—wait. Do not start more than one or two piles at a time until you have got the strip all round your clearing burned. The chances are that the fire will spread of itself into the interior of the chopping without any additional fires having to be lit. By following this course one never gets so large a fire at one time.

If a fire is going to spread, it will do so from one of two causes, either through long flames from the piles of brush catching the tops of the coniferous trees on the uncleared land, although there is very little danger from this source unless there is wind, which is the reason why the clearing fire should never under any circumstances be started if there is any wind to amount to anything, or through what are known as ground fires, where the dead leaves, sticks, etc., in the unchopped portion of the bush catch fire and the fire gradually works into the timber. This can be checked easily if taken in time. Every man who is burning should always carry a shovel with him. The ground fire can be put out by smothering it with sand or soil more quickly than with water. If water is to be used, the best way to apply it is by means of a wet gunny-sack. Throwing a bucket of water on to a burning piece of ground is simply throwing it away. If the weather looks at all cloudy it is best to start the fire either just before or just after a slight rain. The fire seems to clean up the ground better then, and there is less danger of its spreading. I cannot too strongly emphasize the greatest care to prevent fire spreading. Nevertheless, there is no reason why it should spread if ordinary care and common-sense are used. *A fire should never be left until it is completely out.*

ADVANTAGES OF HEAVY TIMBER.

It should be borne in mind that up to a certain point heavy timber is, apart from the stumping, often the cheapest to clear, as anything over 10 inches in diameter would not be chopped, and as a rule the lighter the bush the thicker it is, and it is the thickness more than the size that increases the cost; this, however, is often compensated for by the soil being better. Where there is heavier timber it means more merchantable timber, which costs practically nothing to clear, as wages are made while cutting it. This does not mean, however, that the heavier timbered land is the cheaper to clear or the most desirable. As a rule, the contrary is the case. The wages which are made in taking off the logs or the stumpage for which the merchantable timber can be sold does not go very far when it comes to taking out the stumps, and it must always be remembered that the bigger the timber the bigger the stumps; and the stumping is by all odds the most expensive, and the most tiresome, and, to most people, the most disagreeable work of clearing, although it is, perhaps, the most satisfactory, as a stump once taken out can never come back.

If the burning is done about the middle of August there is usually from four to six weeks of dry, hot weather before the rain comes; it is a good plan to take a mattock and go over the burnt ground, roughly splitting up any large decayed fir logs lying in the clearing. These logs are sometimes too rotten to make cordwood, and being water-soaked will not burn until dried out. The first fire, as a rule, only burns off the moss and the projecting ends and loose pieces, but two weeks of hot sun after they have been roughly split up makes a great change. Two or three days' pulling about with a mattock is usually all that will be needed. As soon as they are dry enough put a spoonful of coal-oil here and there, and thus hundreds of little fires can be started in a day in these old logs, which will smoulder away, often for weeks, and when the rain finally comes it is surprising what a difference this will have made in the clearing. They will not be all burnt up, but a good many of them will be, and they will all be much reduced in size. This rotten wood will smoulder like peat and dry up as it goes along.

SEEDING THE CLEARED LAND.

Seeding down the clearing comes next, and this is one of the most important things in all the clearing operations, as on it depends very largely the profits for the next three years. The new crop of grass-seeds is not yet in the hands of the dealers, and their stocks at this time of the year (August) are often low; so if buying the seed is put off until the land is ready there may be difficulty in getting it, and seeding must be done almost immediately the ashes of the first fire are cool, and in any

case before the fall rains come. (If a heavy rain falls on the ashes before seeding, it forms when it dries a thin skin, which prevents many of the seeds germinating and leaves them exposed to the birds.) The grass or clover seeds should therefore be bought in May or June. If they are sown, say, about the end of August or middle of September, the clearing will be green within a week after the first rain. Many people think it better to put off sowing the seed until the following spring, as they think the young clover is liable to be killed out by frost in the winter; the writer has tried it both ways and unhesitatingly says, seed in the early fall. There is rarely any frost here to hurt clover when it is once rooted, and although the young clover may be killed out in spots if there happens to be a particularly severe winter (that is, severe for British Columbia), this will very rarely happen, and if the seed gets a good start in the fall it will mean a good pasture the next year, while if the seeding is delayed till spring the pasture is nowhere near as good.

The kind of seed used would depend to some extent on the kind of soil and how long it is intended to wait before ploughing or stumping is done. Anything to be ploughed or stumped within the next twelve months after burning should not, of course, be seeded at all. If it is intended to use the land for pasture for two or three years only before ploughing and stumping, the best mixture to use is 5 lb. of timothy, 8 lb. of medium red clover, and about 2 lb. of Kentucky blue-grass. The red clover dies out in from two to four years, but if the ground is ploughed before it dies out it is a very valuable fertilizer when ploughed in, being rich in nitrogen. If it is intended not to plough or stump the ground for five years or longer, then leave out the red clover entirely and use 5 lb. timothy, 2 lb. orchard-grass or cocksfoot, 3 lb. small white clover, and 3 lb. Kentucky blue-grass or red-top. In low damp places put mostly timothy and no small white clover, and on the higher and drier ground put very little timothy and all the white clover. The other grasses may all be sown in either situation. Be sure and get clean seed, the very best is none too good; and while on this subject it might not be out of place to remind the new settler that the highest standard of excellence should always be aimed at. Try and do every part of the clearing, fencing, buildings, drainage, etc., right up to the "top notch," even if it does cost a dollar or two more or take a little longer; do it right once and it will never have to be done over again. The best is always the cheapest in the long run.

DOING THINGS THOROUGHLY.

Many people say, "This will do temporarily; by and by I will fix it"; but "by and by" never comes, and in nine cases out of ten that man goes on patching and repairing to the end of the chapter and never has a decent farm or good fence. He will often lose in one year the cost of a new fence through his neighbour's cattle getting in or his own cattle getting out.

When the seeding is finished and the rotten logs are broken up and burnt, the next thing is to pick and brand up the small logs and charred ends left from the fire. Two or three months' chopping in the spring, if you have a good burn in August, should not mean more than three or four weeks' branding-up in the fall, and this would include sawing all fir logs into 12-foot lengths. Wherever possible, these small logs and loose ends should be piled against a stump or rotten log. Chop everything into lengths that can be easily handled; use the heaviest pieces as a foundation for the pile; pack them in close and lay all the sticks parallel; do not have any cross-sticks, but pile them as closely as possible and top off with any old roots and rubbish that are loose and can be easily pulled up by hand. Don't waste time pulling and straining at anything which does not come easily. What is fast now will be loose next year and will probably plough out by the time you are ready to plough. Any small rotten fir logs which were too wet to burn in September can also be piled, as this is a very easy way to get rid of them. All big fir logs, of whatever degree of rottenness or soundness, if not previously broken up with a

mattock, should be sawn into 12-foot lengths; this is more conveniently done now than later on, and sawn into these lengths they can easily be handled by a team or cant-hooks when they are finally logged up, or if sound enough they are the right length to resaw for cordwood. Some people also saw up the cedar logs at the same time, but in practice it is better to leave them until it is decided what they are to be used for—rails, posts, drain-boards, buildings, shingle-bolts, shakes, etc.

UTILITY OF CEDAR.

During recent years most of the cedar suitable for shingle-bolts in the settled areas has been taken off, but there is generally enough left for all ordinary purposes. This is particularly the case in the Lower Fraser Valley, where these odds and ends of cedar are a very valuable asset.

DESTROYING BRACKEN FERN.

The bracken fern grows very plentifully on all partially cleared lands in the Lower Fraser Valley, the Coast, and many other parts of the Province. If neglected in partially cleared land it will often grow 10 or 12 feet high, and so densely that it is difficult to get through it. The heavy growth of these big ferns is generally considered proof of good soil. As a rule they do not grow in the thick bush; and that is an additional reason why ground should be immediately seeded down after it has been burned over, otherwise fern is sure to make its appearance in a year or two; whereas, if a good sod is kept on the ground until it is to be stumped and ploughed, these ferns will never become a serious pest, but if they are once allowed to get into the ground, the only way is continual cultivation. It used to be thought that continual cutting would get rid of them. It is probable that it would if it were actually continuous. In practice, however, this is found to be almost impossible. However, where there is a heavy growth of ferns to start with, as will be quite frequently the case in partially cleared or logged-over lands, cutting two or three times a year for a year or two will very greatly reduce them in size, although it does not reduce them very much in numbers. In berry-gardens or in root-crops, where continuous cultivation is the rule, they can soon be got rid of, but where the ground is being ploughed for grain or to seed down the only proper course to take is to go over it several times with spring-tooth harrows at intervals of a day or so. This drags the roots to the surface and two or three hours' exposure to the hot sun kills them. Land ploughed in the fall, spring-toothed and reploughed in the spring, and again spring-toothed will show a very marked difference as regards the fern-crop. It has been a common statement that it costs as much to get rid of the fern-roots as the fir-roots, and this is quite correct with some people; but if it is gone at in a systematic and proper manner there should not be much difficulty, and there never would be any difficulty with new land if it were seeded down immediately after its being burned, and stumped within, say, not more than seven years—the sooner, of course, the better. These ferns when dead and ploughed in are a good thing for the soil, as they are rich in potash.

SECOND YEAR'S OPERATIONS.

If the new settler does not intend to work out, but can afford to devote his whole time to clearing up his land, he will find that after the odds and ends from the burning are branded up there will probably be some months of spare time before it is advisable to begin chopping for the second year's burn. This period can be profitably used in getting out posts, sills, plates, rafters, and other timbers for buildings, and in sawing up and splitting the cedar logs for fence-posts, rails, drain and fence boards, etc. By doing this work now it will not interfere with other work later on during the following summer, and which has to be done at a particular time. It would be no use giving sizes of timbers for building purposes, as these would depend

on size and class of building, but the size of posts, rails, and boards for fences and ditches most suitable to this country are standards, and need not be deviated from except in special cases.

FENCING.

A legal fence is 4 feet 6 inches high above the ground. (*See Appendix for full definition.*) The posts should be cut 7 feet 6 inches to 8 feet long if they are to be driven, and about 7 feet 6 inches if set in a dug post-hole. If they are to be driven the pointed end should be tapering, not less than 15 inches long, as they drive much more easily if well pointed. A post to be driven should be about 6 x 6 inches; if to be set in a post-hole in clay land, not less than 8 x 8 inches; or if in sandy or gravelly land, 10 x 10 inches will make a much more lasting job. In driving posts, always bevel off the edges of the driving end with the axe; the fibres of the wood are then crushed by the first blow and the post will not be so liable to split. It is a good plan when driving posts, if the clay is at all dry or hard, to take out one spading first and put a cup of water in the hole before setting the post; it will drive very much easier.

Fences of boards and wires are the most serviceable and look the best, but when a man's means are small and he has lots of cedar, perhaps the best all-round fence is a straight one of posts and rails. As a rule, the posts are set 12 feet centre to centre, but if there is good splitting cedar, make them 16-foot centres, as this will take a 16-foot rail, which can afterwards, if it is replaced with a wire fence, be worked up into two posts. This length of rail, 16 feet, is also the right length for a snake-fence, though the latter should never be used except temporarily, as it takes up a lot of room and harbours all kinds of weeds and rubbish.

In laying out a post and rail fence, it is a good plan to build it with a very slight zigzag, as the panels are then all braced against one another, which adds to the strength, and being a somewhat top-heavy fence, all the strength which can be got is needed. The way this is done is to set the posts in a straight line; use heavy posts and dig holes (do not use driven posts), then lay the bottom rail so as to be alternately on one side of the post and on the other side of the next one, and so on, the full length of fence. Then take light posts, well sharpened, and drive them on the other side of the rail. (*See Fig. 1.*)



Fig 1 PLAN OF POST AND RAIL FENCE

The square posts are those first planted and the round ones are driven. They are not really round and are only shown so in order to distinguish them from the heavy posts set first. This fence is practically straight and looks straight, but is much stronger than if it was really straight.

The rails should be all exactly the same length with square ends. Lay the rails one above the other parallel, and with butt-joints, with a 4-inch or 6-inch distance piece about 12 inches long wedged between the two posts and between each pair of rails. (*See Fig. 2.*) This is very much better than the old way of making

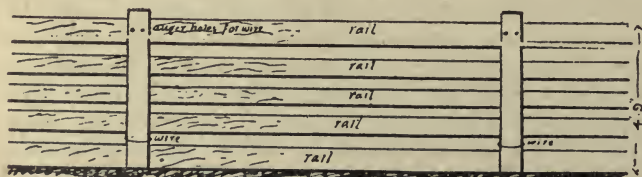


Fig 2 ELEVATION, POST & RAIL FENCE

lap-joints with the rails; they look neater and the rails go a little farther. When all the rails are laid bore two holes through the heavy posts at the top, one hole to go through the end of each rail, and thread a piece of heavy telegraph-wire through them and tie it round the smaller driven post. This will prevent the posts from spreading. Wrap a piece of similar wire round both posts at the bottom, but without holes. It used to be thought that wiring them on the top only was sufficient, but experience has shown that to make a permanent fence that will not want repairing every three years or so it is necessary to wire them on the bottom also.

If first-class free-splitting cedar is plentiful, boards can be split 12 feet long, 1 inch thick, and from 10 to 12 inches wide, and nailed on the post the same as sawn boards on an ordinary post and board fence, either with or without barbed wire. The posts are usually set 12-foot centres. This is not quite so strong as a board-fence of sawn fir boards, but it makes a good fence, particularly for cross-fencing between fields, and is quickly and easily repaired and much cheaper. If split cedar boards are used it is better to use the boards on the bottom only for hog-proofing and wire on the upper part of the fence. If cedar boards are used throughout they are apt to get split owing to people climbing over them, although apart from this a good fence can be made from cedar boards alone. In practice it is found that 4 feet to 4 feet 6 inches is high enough for cross-fences. (See Fig. 3.) Any animal that will jump a 4-foot 6-inch fence ought to be got rid of.

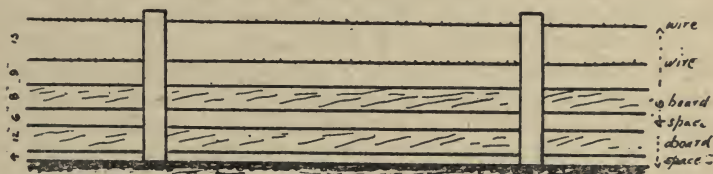


FIG 3 CEDAR BOARD & WIRE FENCE.

If it is intended to put up a post and board, or post, wire, and board fence, then set heavy posts 16-foot centres, and after your lower boards are nailed on, drive light posts (sharpened) half-way between, so as to give a post every 8 feet. The spaces between the boards and wires, shown in Fig. 3, may be varied according to circumstances. For instance, the bottom board may often be put only an inch or two from the ground, to keep young pigs from rooting under. Also, the 6-inch space between the two boards might with advantage be only 4 or 5 inches. This Fig. 3 is intended to represent a fence built with two split cedar boards or rails and two barbed wires. If the boards or rails are less than the widths shown more of them could be used, but it is best to use rails of a sufficient height to prevent hogs getting over them. If suitable split cedar cannot be obtained for rails, it is cheaper, as a rule, to use wire entirely, as sawn boards are now too expensive for fencing.

There are various combinations of boards and wires, but a very serviceable and cheap one is made by using an 8-inch board 4 inches from the ground, then a 6-inch board about 5 inches above it, then three barbed wires; sometimes a 6-inch board is substituted for the middle wire, in which case a 6-inch board can be used on the bottom instead of an 8-inch board. The bottom board being fir should not touch the ground, otherwise it will rot. Fir boards more than 8 inches wide are apt to warp and draw the nails; split cedar boards do not warp and can be made 12 inches wide. If 6-inch fir boards are used, get them, if possible, 24 feet long, as they are then nailed to three posts and make a stronger fence; use not less than 3½-inch wire nails, two nails to each board wherever it touches a post, and three at the ends if over 6 inches wide. If you do not use the boards as soon as they arrive, pile them neatly with small slats of split cedar between them, so as to prevent warping and twisting. Where fir boards are used, always saw off the top of the post to a slope after the fence is completed, so as to shed the rain on the

opposite side of the post to the boards. Split cedar boards are the cheapest, that is of really good splitting cedar; galvanized barbed wire is the next, and fir sawn boards are the most costly, though many people think they make the best fence and look the best. For dairying and small fruits, hogs and sheep, any of the above fences are equally good, but if you are keeping high-grade horses it is as well to use either a post and rail fence or a post and board fence with no barbed wire.

The best fence, however, beyond any doubt, is a heavy woven wire, and while this is a little more expensive it is often the cheapest in the long run. These woven-wire fences, however, do not stretch well on rolling or uneven ground, for which it is necessary to get what is known as a hinge-weave fence. This is generally much lighter, the top and bottom wires being the only ones that are stretched. It is very serviceable, but should have a barbed wire stretched on that side of the fence on which it is likely horses will be running, as otherwise the horses rub themselves on the fence and very soon spoil it. The barbed wire will keep them off without hurting them. It is generally stretched about 3 feet 6 inches to 4 feet from the ground. One of the most satisfactory and at the same time one of the cheapest fences is a comparatively light woven wire, about 3 feet, for hog-proofing, with two barbed wires on the top to bring it up to 4 feet 6 inches in height. This is slightly cheaper than the full-sized woven wire, lasts just about as long, and does not get out of shape so readily through people climbing over it, as they can get through between the barbed wires. Many people object to barbed wire and use a spring steel wavy wire and wooden slats. While this looks very neat, it is an expensive fence, as it takes so long to set it up and the wooden slats are constantly getting broken. For a small farm, however, this is probably one of the neatest fences.

In a board and wire fence on the roadside, where light driven posts alternate with heavy posts, it is a good plan to plant alongside or behind the light driven posts a young tree of some ornamental kind, say Lombardy poplar, maple or walnut, or some of the thorn or crap-apple varieties; they cost little or nothing to plant and add very much to the appearance of the farm, and by the time the light post has rotted out you have a living tree to take its place. These trees are not needed as a wind-brake, but afford shade for cattle.

If living trees are being utilized for fence-posts, never staple the wire on to the tree, since, as the tree grows, it gradually grows around the wire, and the tree will eventually break off at this point. The proper way to do is to nail a light slat on the side of the tree on which the fence is being built—say 3 x 2 inches—and staple the wire on to that. If a nail not too heavy is used, the swelling of the tree as it grows will gradually force the nail and board out together, but if a long, heavy nail is used it will force the board out but retain the nail, which is gradually covered up by the growth of new wood as the tree gets bigger. When this happens all that is necessary is to nail on a new piece of 3 x 2.

While on the subject of fencing it should not be forgotten that at the end of the first year's clearing there will probably be only one boundary permanently cleared, and that is that part of the clearing fronting on the road; a permanent fence, either post, board, and wire, or a straight post and rail fence, can be built on this. The same kind of fence can be built on the side-lines if your neighbour has also cleared up to the line, but on the back line a temporary snake-fence of 16-foot rails should be built. The next year, if the clearing is extended, it may be necessary to take this down before burning, and in any case after the burning it will want moving, so as to include the new clearing. It is as well not to build any permanent fencing for a year or two except on your boundaries, until you have a good amount of clearing done and can get an idea as to how the fields are to be divided.

HINTS AS TO CORDWOOD.

Since the first two editions of this bulletin were printed, so far as cordwood is concerned many changes have taken place in this Province. At that time cordwood was sold on the river-banks at from \$2 to \$2.50 a cord and was used chiefly by

the steamboats. Since then the price has risen to from \$6 to \$10 per cord. It is not used by the steamboats on the Lower Fraser to any extent now, but it is still used sometimes on the Interior rivers, and there is a good market for it also in many of the small towns.

A new settler on a bush clearing is hardly likely to have a team and wagon the first year, so he will have to depend on his neighbours for hauling the cordwood. This is usually done in the early summer and should start as soon as the roads are dry enough to stand heavy loads. In making a contract for this there should always be a stipulation that all the wood shall be removed from the clearing by July 15th at the latest, and delivered on the river-bank, or wherever the cordwood market is, not later than September 15th, otherwise it will have to be left to the following year, when it will have slightly deteriorated. The reason for having it removed from the clearing by July 15th is that until it is removed it is not safe to burn any of the log-heaps from last year's clearing, and it is often convenient to be able to burn these at any time the weather is suitable and before it gets too dry, as, if left too late, the fire may run over parts of the newly seeded ground. In cutting this cordwood it should all be cut and split the winter or spring following the burning and hauled the following summer. Saw it into 4-foot lengths and split up everything that will make cordwood. Old fir logs, if not too dozy, and all the second-growth fir, hemlock, and spruce, or even a few big cottonwoods or alder, will not be amiss. All hardwood, such as alder, maple, cottonwood, etc., should be split. Do not cut anything too small to split. Fir, hemlock, etc., need not be split unless it is too big otherwise. The reason for this is that the hardwoods, if unsplit, will go dozy in a few months; that is, there is an incipient rot, which greatly deteriorates the wood. This is particularly the case with alder; this does not apply to any of the coniferous woods. In the case of green trees, carefully pile all the branches and tops in one big heap against an old stump, if possible. The cordwood should be neatly piled in piles 4 feet high and 8, 12, or 16 or 32 feet long, so as to make it easy to measure. Don't pile it in little promiscuous heaps; the man who is going to haul it likes to know how many cords he is going to haul.

A cord of wood is 8 feet long and 4 feet high, the sticks of wood themselves being 4 feet long, so that each cord of wood contains 128 cubic feet. When wood is piled on the river-bank for delivery to the steamboats, it is usually put up in three-cord piles; each pile being 16 feet long by 6 feet high; with the wood being 4 feet long, this makes 384 cubic feet to each pile, or three cords.

It is suggested that the cordwood will all be cut after the land has been slashed and burnt over, but if the settler has a fairly large piece of land it will often pay to split a certain amount of wood during the winter in the green timber after the sawing-up and other suggested winter work has been done. This makes less chopping later on, and less burning, and it should not be forgotten that the smaller the amount of coniferous woods that are burned on the ground the better. Hardwoods do not matter, as the ashes enrich the soil; but there are very few ashes from the coniferous woods and the fire gets so hot that it burns the humus from the top soil and sometimes spoils it for two or three years.

In the Lower Fraser Valley it would not, of course, pay to cut anything into cordwood that will make ties or saw-logs, so that, as far as the coniferous timbers are concerned, this means that the only wood available for cordwood would be the old first-growth logs and green standing trees, less than, say, 10 inches in diameter. It is safe to say that anything of a greater diameter would be more valuable for other purposes than cordwood; but this rule does not hold good in many other parts of the Province.

If the land which is being cleared is outside of what might be called the cordwood or shingle-bolt belt, say more than three and a half miles from the market or shipping-point, it would be as well only to cut down the second-growth fir over an area as large as would be wanted for hay on a 20-acre farm, say 5 acres, and on a 40-acre farm say 10 acres. If it is intended to dairy, speaking generally, about

three times as much rough pasture is wanted as hay land. Five acres of good land, well cleared and in good order, will give about 15 tons of timothy or clover hay, which is all that would be wanted for, say seven head of cattle during the winter. If you are not milking, cattle will pasture out more or less nearly all winter on the Lower Fraser.

BURNING THE STUMPS.

On land too far from a market to sell cordwood or shingle-bolts it will be necessary to burn everything on the land you are going to use for hay. On the balance of the land it is better not to cut any standing coniferous timber over 10 inches thick (as some day these will have a good value for saw-logs), but seed down for pasture, using a much larger proportion of small white clover and orchard-grass, and leave out the medium red clover entirely. The great mistake many settlers have made is in cutting the timber down and burning it, simply to get rid of it, forgetting that they are destroying a valuable aid in getting rid of the stumps. If cordwood can be made profitably out of this timber, all the better; but if not, then use the timber for burning out the stumps. Probably the cheapest way to get these out is by powder; but where there is a certain amount of good wood to burn, anyway, it is better by far to burn it to the best advantage, and the best possible way to do this is to burn out the first-growth fir stumps with it.

The various means of getting rid of the big stumps are referred to later.

KILLING THE SPROUTS.

The clearing is now one year advanced; it is chopped, burnt, seeded, branded up, fenced, and the cordwood cut, stacked, and ready for hauling next summer. The process of clearing so far described should be repeated every year till all the farm is cleared to the same degree and in pasture.

The summer following the first chopping the ferns should be cut three times if possible, as before mentioned. It will be found that while the first cutting will take about a week (for 10 acres), the third cutting will not take over a day or two. About August, after the second clearing is chopped and before it is burnt, there should be about two weeks' spare time. Get a small camping-axe (75 cents), with a short handle about a foot long, and spend a few days in cutting out the willow, hazel, and vine-maple sprouts growing up from the roots of last year's clearing. Do not be satisfied with pruning them off, as a good many may grow again, but knock them off at the root. There is no need to spend much time over this, as a good many of the smaller ones will be nibbled off by the cattle or sheep and others will die out in any case the second year, but what you do chop or knock off treat thoroughly.

If these sprouts are not destroyed the root will not die and will eventually have to be dug out by hand, while, if the roots can be killed the first or second year, another year or two will see them gradually disappear, and when the real stumping commences there will be none of these small stumps left. This greatly reduces the cost of clearing.

BETWEEN-SEASON WORK.

It is a good plan during the time of chopping the next 10 acres, whenever there is an extra-warm day, to burn off a few piles of the "branding-up" heaps (taking care not to burn any of the cordwood). It lends a little variety to the work of chopping. These branding-up heaps can be burnt almost any time between April and September. When the fire is out, pick up any fragments left and pile them on the nearest unburnt heap and immediately seed down the burnt spot. If rain falls before the seed is sown, drag a handful of brush (two or three fir branches) over the ashes after the sowing. This will cover them and give them a good start.

When you have got all the "branding-up" piles, and the piles of branches from the trees which have been made into cordwood, burnt, and the cordwood hauled

away, the clearing is finished as far as the pasture stage is concerned; that is, there is nothing further to do to it so long as it is only going to be used for pasture; the bulk of the old logs will have been used up, the fir for cordwood and the cedar for fencing, buildings, etc.; all that will be left will be the stumps and a few fir logs too rotten for cordwood. The following year the pasture will be first-class, and as good as could be wished. Last year, by the first of June, the writer had clover over 2 feet high on a piece of clearing at the same stage as that described above, and it was very thick. If it had been cut for hay on that date it would have gone over 2 tons to the acre.

If it is the intention to stump and break up the land as soon as the stumps are ripe, then the following winter it would be as well to spend a few weeks in preliminary work, which will consist of a few underdrains and logging off the old rotten logs. The draining should be done first, as it dries out the the wet places and helps the rotten logs to dry out too. Most of those that are too rotten to handle with a team can be burnt off without handling at all during August, by the coal-oil method before described. The use of a bottle of coal-oil and a bunch of matches, or a gum-stick torch, will greatly reduce the time required for burning the brush-heaps and branding-up piles; in fact, 10 cents' worth of coal-oil will often save a day or even two days' work, as no kindling is required to start the fires, a small handful of leaves or dry ferns only. It is by using all these little time-saving devices that the cost of clearing is so greatly lessened.

CLEARING FOR POULTRY AND BERRIES.

The clearing operations so far described apply more particularly to land which is going to be used for mixed farming, dairying, or stock-raising, where the cost of clearing is a most important question. The clearing done as described above can be done more cheaply than in any other way, the idea being that when it has reached what might be called the "pasture stage" it is all right to leave it like that until the stumps are completely ripe for taking out—that is, rotten or at least semi-rotten. This will take from three to seven years, depending upon the size of the stump and the variety of the timber. It is not worth while in any case leaving it longer than seven years, as, in the case of old-growth fir, hemlock or cedar stumps, to make any appreciable difference after seven years would mean a further very considerable lapse of time, and this is usually not worth waiting for if the settler has the means for taking the stumps out.

The circumstances of clearing up a small acreage for chickens or berries, however, are quite different. In this case the question of cost is not so important, as \$100 or even \$200 an acre, more or less, in the cost of clearing is more than offset by the saving in time. This is particularly the case in connection with berry-growing. If the land is for poultry-raising only, the best course to take is to get rid of most of the standing timber first, on at least an acre, then immediately grub out the small roots (willow, alder, etc.) on the building-sites and for a small garden-patch. Then, when the various chicken-houses, etc., are built and the runs fenced, the small stumps (up to, say, 10 inches in diameter) can be grubbed out without one's having to wait for them to rot. The larger ones would have to be taken out later as opportunity occurred. It is, naturally, important to a man owning only 5 or 10 acres to get it producing as quickly as possible.

In the case of a piece of ground intended for berry-growing, probably the example of the Japanese is about the best to follow. There are large areas of berry land in the Lower Fraser which have been cleared by Japanese within the last few years and almost entirely put into berries (strawberries and cane-fruits, chiefly). Their system is to cut down and burn up the timber of half an acre and immediately start taking out the stumps, big and little, as they come to them. As soon as a small patch is stumped, no matter how small, the ground is graded by hand, and, if the time of the year is suitable, berries are immediately planted, so that by the end of

the year there is half an acre at least bringing something in. No ground is wasted growing anything except berries. The word "wasted" may seem a strange one to use, but so long as berries are bringing their present prices—\$700 to \$2,000 an acre—it obviously pays better for the berry-grower to buy his milk, butter, eggs, etc. The principal thing is to make every yard of ground as it is cleared immediately productive. This, of course, cannot be done in the case of a mixed farm, in which case an entirely different system of clearing (as previously outlined) must therefore be adopted. The system of grubbing everything out green as it comes to is, of course, very much more expensive, but the cost of clearing is, comparatively speaking, no object when the crop produced is so valuable. This kind of clearing, however, would obviously only apply to lands within quite easy distance of a shipping point (say three or four miles), and preferably a shipping-point on a through line of railway giving access to the Prairie markets or to a fruit-cannery.



Picking up logs and smaller stumps after grubbing with donkey-engine at Development Area No. 1, Merville, Vancouver Island. (Courtesy of Land Settlement Board.)

HANDLING BIG LOGS.

There will probably be found occasional large fir logs too rotten for cordwood, but too sound to be broken up with a mattock. These logs often have layers of sound pitchy wood in them, but not enough to pay to make cordwood. They often appear to be the most difficult part of the clearing, but they are in reality very easily got rid of. They should be sawn up into 6-foot lengths (they were already sawn into 12-foot lengths when the clearing was branded up) and split into large pieces about 10 or 12 inches thick (much larger than cordwood) and laid back on each side of where the log was. When it is all split up, pile it back again in the place where the log originally lay, in 6-foot sections, each section to butt close up to the adjoining one; pile it carefully and as closely as possible, then start a fire with dry cedar in any of the sections (depending upon the direction of the wind), feed the fire with dry wood until it has caught well, and then let it go. The whole of that log will burn up clean, no matter how wet it is and no matter how bad the weather is. Of course, it is best to start the fire on a dry day, but rain or snowfall,

after the fire is once started, will rarely put it out. After the log is once split, however, it should be repiled and burnt at once. Don't let it lie exposed to rain, as it will not burn so well if the split pieces are allowed to get wet before repiling.

There is always a considerable amount of rotten wood alongside these old fir logs, which is in such small pieces as to be difficult to handle. The heat of the fire will dry these out for 3 or 4 feet on each side of the log, and the fire will usually catch and burn up all the rubbish. Very little attention is needed and very little branding-up. These large pieces are heavy to handle, and it is as well to exchange work with a neighbour for a day or two while these logs are being burnt. Always repile the log in the place where it originally lay. The reason for this is, first, that it will then burn up all the rubbish on both sides with the least handling, and, secondly, because the log invariably lies in a slight depression caused by its own weight, and as the ground under the fire is sure to be badly burnt, when you come to plough and level off, this burnt spot is naturally covered up.

When this log is almost burnt up is a good time for taking a shovel and shovelling into the hole left by the burned log (which, with many burning embers in it, is still hot) all rotten wood lying anywhere near the log. This is the last opportunity you will have of getting rid of this rotten wood at practically no cost. If this is not done, the rotten wood will afterwards have to be raked together and burned—and it is a tiresome job to do this—but if shovelled on to the log-fire before it goes out it will all be cleared away. This rotten wood should be got rid of in any case, as it is a great detriment to the soil if ploughed in.

LOG-BURNING.

The best system for burning the smaller logs and the roots and stumps is somewhat different; in most timbered sections there will probably be one or more gullies, or if not there are sure to be depressions with rising ground on each side. Dig out of the side of the gully about 8 or 10 feet from the top (or out of the rising ground at the side of the swale, as the case may be) a good-sized hole about 14 feet square with a flat floor, somewhat as if you were going to build a bank root-house. (See Fig. 4.) And in the hole dug out build a pile of logs, old roots, or anything at all that has to be burnt. The site of this burning-pit should be chosen in as central and convenient a place as possible, having in view the logging not only of what is now cleared, but what is going to be cleared next year. Sometimes two neighbours



FIG 4 CROSS SECTION OF BURNING PIT.

can join at one burning-pit if it is dug at a point convenient to both of them. This pit may take a day or two to dig, but it is well-spent time, as it may save weeks of work afterwards.

The actual logging is best done, where possible, by two or three neighbours joining together and exchanging work; many hands make light work, and many teams make it lighter, but it is surprising, even with only two teams, how quickly the ground is cleared off. Do not start the fire now, but after the pit is once full haul everything up to the edge, or as near to it as possible, and leave it exposed to the sun to dry out for a while, and then when the logging is finished a fire can be started in the pit almost any time of the year, even in the winter if there is enough dry

wood to give it a start. Every morning on the way to work, and every evening on the way from work, spend half an hour in poking up the embers of the fire and rolling over the edge of the pit a fresh supply of logs and roots. Put on the small stuff first and then roll on some of the biggest or wettest. With very little attention the fire will never go out till everything is burnt up, and there will be a good pile of ashes left which can be hauled away and spread over any bare spots on the clearing, whereas, if there had been a number of log-heaps scattered here and there, there would not have been enough ashes anywhere to have fertilized any one burnt spot. The same system of burning can also be applied when you come to take out the stumps, particularly the smaller ones and the second-growth firs that have been cut for cordwood. This system of logging is a long stride in advance of the old method of piling in heaps and burning on the ground, as the soil, not being spoilt by overburning, is only one of the advantages. It is much lighter work, as almost all the handling is done by teams, and it takes far less time both in getting the logs ready for burning and also in the burning itself. In the first place, the logs need rarely be sawn into anything less than 12-foot lengths, and very little splitting is necessary; there is no lifting or skidding required at all, and if this lifting or skidding is done by hand it is the heaviest and hardest work of all the clearing operations, besides taking from two to four men. Then, again, when you have an ordinary heap of unsplit logs burnt, there is probably half of it left, and it has to be repiled and branded up, and this cannot be done until the fire is quite out and the ashes cold, which will often take two or three days. In addition, the branding-up operation often has to be repeated two or three times; besides which, you can only burn unsplit log-heaps in the dry weather, just at the time when you are busy with something else.

The burning-pit method is largely intended to be suggestive; in practice many slight modifications will probably suggest themselves; one good plan is to blast out one of the largest fir stumps, at some central or convenient point in the clearing; do not be afraid of using plenty of powder. Use too much rather than too little; put the hole away down below all the roots, the length of a long shovel handle at least, so as to get the end of the hole well under the centre of the stump, the object being to blow out the entire stump at one blast, so that not a fragment remains in. This will also blast a very large hole in the ground, which can be used as a burning-pit, and will have all the advantages described above, besides the additional one of having got rid of the stump at no more cost than digging the burning-pit. You can burn all the logs and rubbish and other roots in this hole without burning the surface of your ground, exactly in the same way as is described above. After the large pieces are logged out and either piled in the hole or round the edge of it, there is often a good deal of more or less rotten stuff which is very wet. To save handling this twice, it is advisable to start the fire in the burning-pit, and then when this has burned down a little keep hauling on the small rotten pieces of wood and other wet material. This can be thrown in (no matter how wet it is) and will all burn, and by burning it now it saves rehandling later on.

If it is the intention to take out the big stumps before the ploughing is done, then it is better to take them out at this stage while the logging is going on, as there is then more material with which to burn up the stumps. In some cases, if all the logs are burnt before the big stumps are taken out, it is more difficult to burn these big stumps up after they are blasted, as it often needs some loose and smaller material to keep the fire going.

The operation of logging and burning up the logs and stumps is the bugbear of every one clearing land, and it often deters people from starting, but if done in the way suggested above most of the "hard-work" part of it is taken out, and the time required greatly reduced. The team-work required when using a burning-pit is very little more than is required by the old method. Logs and stumps can be hauled to the burning-pit for a distance of about 30 to 40 rods, and it is still cheaper by this method.

DITCHES AND UNDERDRAINS.

On the average bush land very little draining is required, but as such land is generally rolling there will probably be some few swales or wet places, which will be none the worse for a little ditching. As a rule, however, no systematic draining is required. A careful survey or prospecting should be made not only of the present clearing, but of the whole farm, to see which is the lowest place, or the natural outlet for the drainage. If this is not readily ascertainable, it is better to put off all the draining until the whole block is cleared for pasture, as a general bird's eye view can then be got to very much better advantage. If the outlet is on an uncleared part of the farm, then put it off till that part is cleared, as the ditching is done much more cheaply when the land is chopped and burnt.

It may often be necessary to begin the ditch on adjoining property in order to get a proper depth on your own land. If your ditch is going to follow a natural watercourse, there is nothing to prevent your going on to adjoining land in order



Pea-field. Six years after clearing.

to get an outlet. The ditch should be started far enough down the depression or low place that you are draining into so that you can get a depth on your own boundary of not less than 2 feet—2½ feet would be better. There is generally not much difficulty in getting this depth. If, however, the fall of the ground is very slight, necessitating your having to go some distance over adjoining property to get a proper outlet, then it may be advisable to invoke the aid of the "Ditches and Watercourses Act," whereby all land-owners benefited have to pay a portion of the cost; but it is not often that this is necessary. As regards the size of open ditches, this will, of course, always depend upon the amount of water which the ditch has to carry. Always remember that the ditch is dug to carry the winter's water, not the summer's, and that a creek or wet place which looks little or nothing in the summer may be quite an imposing stream in the winter. The sides should have

a good slope. A ditch 2 feet 6 inches deep and 1 foot wide at the bottom should be about 4 feet wide at the top, but this will depend a good deal upon the nature of the soil and other conditions. On account of the cost of keeping open ditches clean, it is always better to make an underdrain where possible in preference to an open ditch. If you are putting underdrains in a swale or depression much over 4 rods wide, it is better to dig one at each side of the foot of the rising ground and let these two ditches come together again where the swale narrows.

On level ground, in alluvial clay, the underdrains should be 3 feet deep, and in peaty land or black muck 3 feet 6 inches deep, but in upland clay or clay loam 2 feet 6 inches is deep enough; the character of the soil will determine the depth; 12 to 18 inches wide is enough in all cases, but if the drain is to be an open ditch it should be 2 feet 6 inches to 4 feet wide at the top and about 12 inches at bottom, with sloping sides, or if a considerable amount of water is to be carried, then wider in proportion. The best time to dig ditches is when the ground is soft, but there should not be too much water (say just enough to give a grade). Early summer or early fall is perhaps the best time, but they can often be dug to advantage in winter.

Dig the ditch or drain as near as possible on straight lines. Do not put in any long curves. Use two stakes and a piece of strong cord to line it out and keep it straight; do not trust to the eye. If the swale or low place to be drained is not straight—and it is very unlikely that it will be—then zigzag the ditches to fit the curves, rounding the angles or making very short curves. If an underdrain has to be opened up at some future date, it is much easier to find it if it has been laid in straight lines instead of long curves.

This question of underdraining is chiefly a problem for the Lower Fraser Valley and Coast districts, although a little of the same kind of draining may be required in other places in the Province besides. It used to be the custom to make most of the underdrains of cedar rails and boards, but the writer's experience is that in the high clay loam lands it is the worst kind of economy to use cedar at all. Burnt tiles or well-made cement pipes are unquestionably the only kind of underdrains which should be put down in ground of this kind, and this applies also to drained beaver-marshes, particularly if the drain is in clay. Many people will be disposed to question this, but it is doubtful if any of these cedar underdrains in wet places on high land last for more than a very few years. They invariably have to be taken out and replaced with burned clay tiles or cement pipes, and if this has to be done anyway, it might just as well be done first as last. No kind of wood—and cedar is undoubtedly the longest-lived under the circumstances—will last more than a few years, and very often for some time before the wood rots the drain will be choked by a fungus-growth. The writer has replaced cedar underdrains in land of this character within four years after these were put down, and taken out masses of fibrous fungus-growth yards long, which have completely choked the drains. Three-inch tiles will generally be found quite sufficient; even 2-inch in many cases. It is a considerable flow of water that needs a 4-inch, although sometimes a wet swale on which a small creek runs in the winter may require a 6-inch, particularly if many other wet places run into it; but this is not often.

The best tool to use for laying these tiles is a boy scout's axe, with a pick at one side and a small chopping-edge at the other. This and a garden-trowel (the heaviest that can be got) are the handiest for the purpose. The axe enables one to quickly cut and shape any of the tiles and the trowel is handy for laying them evenly. Do not be afraid of getting tiles a little overburnt. Most of the water drains off through the joints and not through the tile. If cement tiles are used, be sure to get them sound and to ring well when struck. Do not put in anything that is in the least doubtful, and be sure that they are thoroughly seasoned and hard before putting them in. Most of these cement tiles are generally a little on the porous side, and if they are put in before they are thoroughly cured and hard some of the clay seems to soak into them with the water and quickly rots the cement.

If you have occasion to dig a drain up and put it in another position, do not leave the tile exposed to the weather. Have the new ditch dug first before the old one is taken up and set the tiles in as quickly as possible, covering them up; otherwise the clay tile will disintegrate. Always start to lay the tiles at the upper end of the drain and work down towards the outlet. It is best to have a little water running in the drain as they are laid, as this enables one to see whether the fall is even. The fall should be as even as possible. Do not have a very flat fall and then a very steep one if it is possible to avoid it without digging too deep. Do not, if it can be avoided, dig an underdrain to run into one already covered and filled in, as it will very likely result in the blocking-up of the part already covered.

Draining river-bottom land or flooded land in clay silt or peat soil is a somewhat different operation to that described above. If in clay silt, the drains should be dug 2 feet deep and about 12 to 18 inches wide—just about wide enough for one to stand in—and then a core taken out of the bottom about a foot deep with a long, narrow ditching-shovel, as per Fig. 5. In digging the core or tongue the shovel should be held almost straight up; otherwise it will not be 12 inches deep. This depth of tongue is required, as there is usually a very slight fall on these flats, and after the ditch has been in a few years the upper end will gradually silt up with fine mud and sediment, perhaps 8 or 9 inches, so that the ditch will form its own grade and be the full depth at the outlet. This tongue should be covered, preferably with split cedar boards, 12 inches wide, $1\frac{1}{2}$ to 2 inches thick, and about 6 to 12 feet long, laid lengthwise. The old system was to cut 12- to 18-inch lengths and lay them crosswise. The other way is much more quickly and cheaply done and makes a far better job, as, if a horse happens to tread on the ditch when the ground is very soft, all its weight is put on the one cross-board and it is very liable to crush in the shoulder of the ditch. It used to be thought that by putting in the long boards a horse treading on the underdrain might split the board and crush it in. In practice, however, this does not happen, as when the ditch is once filled in, even if the board should become cracked, the weight of soil on the top holds the board in position on the shoulder. In very soft ground it will sometimes be found that the shoulder will not stand up. In that case a wood crosspiece—one or more—may be put across in the ditch and a long 12-inch board laid on the top. Occasionally the ground will be in spots too soft even for this. In that case wide,

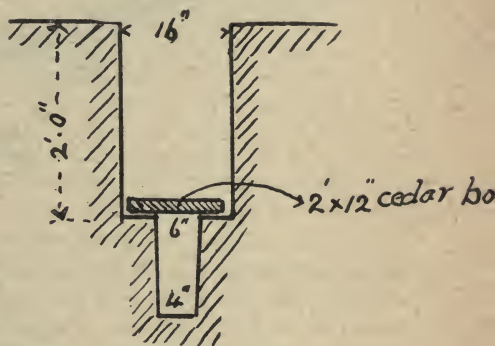


FIGURE 5

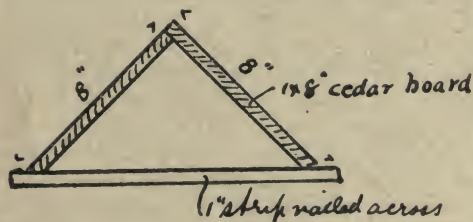


FIGURE 6

heavy cedar rails will have to be laid in place of the shoulder. Cedar boards in this kind of soil will last a long time—twelve or fourteen years at least, probably longer. Where split cedar of this quality cannot be got handily for the covering-boards, $1\frac{1}{2}$ -inch sawn cedar boards will do, or cedar slabs from the sawmills. Many people dig a ditch 3 feet deep and put in 1 x 6-inch or 1 x 8-inch cedar boards, as per Fig. 6, with a short piece nailed on the bottom to

keep them apart. This, however, is not at all a good system unless there is a fairly good fall, as they are very liable to get blocked up.

Underdrains will not draw well over 40 rods in length unless they are open at both ends, so that if they are going to be much longer than this they should have an open ditch at both ends.

It is often desirable where there are open ditches in a field to have drinking-places; otherwise cattle will get into them and very soon break down the sides and block the ditch. These drinking-places should be made by the digging of a sloping passage away on one side of the ditch (see Fig. 7) and flooring it with split cedar rails. The bottom of the ditch at this point should be paved with large cobblestones and a load of gravel should be put at the top of the split cedar passage-way; otherwise it will very soon be tramped up into mud. All open ditches should be

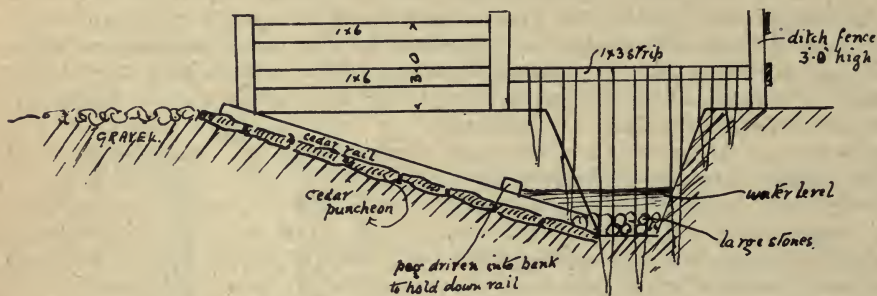


Figure 7

fenced on both sides to keep out cattle and hogs. A very cheap fence only is necessary, and one not over 3 feet high. The sides of the drinking-place where it meets the ditch should have a number of driven cedar pickets across the ditch sufficiently wide apart to offer no obstruction to the water in the ditch, with a rail nailed to the top to keep them in position. This prevents hogs going up the ditch.

STUMPING.

The last stage of the clearing operations has now been reached, the stumping. The taking-out of the last of the smaller second-growth firs, cedars, etc., should be done about four to seven years after they are cut; the longer they are left the easier they will come out, but the big firs and cedars can be safely left until the farm is in a good, profitable state; in other words, this last stage of the stumping should be done out of profits and not out of capital, unless a man has ample means, as the big stumps, unless very numerous, do not interfere to any extent with the profitable working of the farm.

There are several methods of handling the big stumps and it would be unwise to lay down any hard-and-fast rules, so much depends upon the man himself and the means he has at hand, as well as many other circumstances, such as soil, acreage, etc. It might be as well, however, before describing the various methods, to say that large stumping operations done with donkey-engines are altogether out of the reach of the average man, and, while this method of taking out stumps might be advisable in some few cases, it is not generally applicable. Before work with a donkey-engine is undertaken several conditions are necessary, and the lack of any one of them is liable to make it very costly. It should be remembered that a donkey-engine crew is a very high-priced crew, and that whenever the engine is not running (in the case of a breakdown of the engine or cables or any of the tackle) the wages of the whole crew still run on, although practically all of them are idle. It can safely be said, although contrary to the common understanding, that to take out even green stumps with a donkey-engine is a very expensive method of getting rid of them. It is better in any case to allow the stumps to ripen; that is, to become

partially rotten. Under any circumstances the smallest area which it would be worth while to stump with a donkey-engine would be 40 acres, and that is little enough. The cost of getting the donkey to the site, setting up the gin-pole, etc., is so heavy that there should really be more than 40 acres. If there is only 40 acres, then the distance from the previous job should not be over half a mile; otherwise there is too much money spent in preliminary work. Another very common error is in getting a donkey-engine crew or logging crew from a logging camp. The work is entirely different in a logging camp. Loggers are notoriously a somewhat careless lot. Speed in getting out the logs is everything and the wreck and ruin left behind is quite a secondary matter. In clearing land for farming purposes, while speed is, of course, important, it is necessary to do everything thoroughly. Apart from the man running the engine, the most suitable crew for this purpose would be men who had had previous experience in logging with horses and blocks and tackle. The actual cost, however, of clearing land with donkey-engines is a very much disputed point; but even under most favourable conditions—that is, where there is no standing timber and where the area is large, where the timber has been cut some time and where there is a well-drilled crew—it is safe to say that the cost to complete the stumping so that the land is ready for grading and ploughing will rarely be less than \$200 an acre, and often far more, and this puts clearing by this method out of sight for ordinary farm purposes, particularly as a large amount of cash would have to be found by the settler, who is generally none too well supplied with this very necessary article. If the clearing has been done in the way outlined in previous pages up to the stumping, it is safe to say that the actual stumping can be done by other methods at a figure far below this, besides which it costs very little in actual cash, powder being the chief item of expense, and it can be done a little at a time as opportunity and means are available. Some of the different methods will now be referred to.

CHAR-PITTING.

This system of taking out stumps has not been employed very extensively in British Columbia. It was for a period very popular in Washington and Oregon, and it has been tried here and found very successful under certain conditions, but these conditions are not by any means universal. It is applicable to old-growth stumps only, and again only to fir and spruce stumps; cedar, hemlock, cottonwood, and balsam do not char-pit successfully. The soil also must be just right—a good clay loam or, what is better still, a stiffish clay. Sandy soil is almost hopeless, as the sand falls in and puts out the fire. It is no use attempting to char-pit second-growth fir, no matter how large.

With the right kind of stumps and the right soil, the method is as follows: A small fire of odds and ends of sticks or anything that will burn is built. One or two pieces of cordwood cut up into small pieces are a good start. These are all piled up in a fork of the roots, against the main trunk, first clearing away all soil from the roots where the fire is to be made. Light the fire and keep it going for fifteen or twenty minutes until you have got a bed of hot coals. Do not make the fire too big, but keep feeding it until the trunk of the stump itself has caught. Then cover this up with upended sticks of moderate size. Then, as quickly as possible, cover up with sods and on top of these clay. Then gradually bank up with sods and clay the whole stump up to about 3 feet in height, including any large roots projecting from the side and rising above the ground. One man can attend to several stumps, as they will burn from a few days to a couple of weeks. The fire should not be allowed to break out, but should be always kept well covered up. It will take a little practice for any one to get on to this system properly, but the system is certainly a great saver of labour and of powder, particularly if the land has been already logged and there are not many large pieces of wood to help in burning the stumps by the open-fire method. It will probably be found that there

will be a number of snags to dig out afterwards, but these can all be dug out by hand without a great deal of work. This system is not suitable for stumping in a large way, particularly if done with hired labour, but it is a very convenient one where a man is doing all his own work, as he can start one or two stumps each day and leave them for many hours while he is doing other work, and if he is doing it himself it is more likely to be done thoroughly and with particular care than if a hired man were doing it. The actual length of time spent on this work is comparatively small, but if the ground is not suitable or care is not exercised there will be a considerable amount of digging-out of small roots afterwards; but if the work is well looked after and the ground is suitable there is very little of this. The system is particularly suitable for small acreage where the settler is in the poultry business, as it avoids blasting and enables him to get rid of his logs first without detriment to the getting rid of the stumps afterwards.

THE BIG-BLAST POWDER METHOD.

Another method of stumping which is very popular, and a very good one too in many cases, particularly if the settler has some small means, is to use powder in rather large quantities, sufficient to take the entire stump out at one blast. For this a hole should be dug underneath the centre of the stump about as deep as the length of a long shovel-handle (this is for large first-growth stumps). One must be sure the hole is deep enough and as near as possible in the centre, and the powder must be well tamped in. When the blast goes off it will lift the entire stump. It is true there is a large hole to fill in afterwards, but it is much easier to fill in the hole than to dig out the stump, and a good deal of the stump can be burned in this hole, and it is generally deep enough for many of the pieces to be safely buried in it. This system, however, can only be adopted to advantage where the settler has a team, as the pieces of stump blown out are, as a rule, far too large to handle by hand. Plenty of powder must be used, as if there is any portion of the stump left in it has to be dug out, and it means a tiresome, awkward job. Do not dig around dug and pulled out with teams and blocks and tackle, with the aid of an occasional stump to be blasted or expose any of the roots. The idea in blasting by this method is to blast the earth underneath the stump, as the whole thing is then lifted together. This system cannot be followed with hollow cedars. They have to be small blast. It is impossible to give anything more than very general hints as regards the blasting of these big stumps, as experience and the means at hand will decide the system of work. It can safely be said, however, that the cost of getting the stumps out, if the work is intelligently and systematically done, is, as a rule, very much lower than has been generally supposed. In burning the fragments of stump afterwards, careful piling is important. It should be remembered that, so long as two pieces of wood are either touching or within an inch or two of each other, the fire will not go out and will burn continuously until everything is burned up, but if they get 4 inches apart the fire will gradually die, so that one should always try and pile up logs and roots so that as they burn they will fall towards each other. This is one of the advantages of burning in a hole which has been blasted out or in a burning-pit, as there is a natural tendency for the partly burned fragments to settle and fall in towards each other. Careful piling saves a lot of extra work afterwards. The greater the depth at which the explosion disturbs the soil the more likely it is that all the roots will come out at one blast. This is always the thing to be aimed at, as, if the stump does not come out at the first blast, as it blows the soil out and bares the roots, it is usually impossible to get a satisfactory blast again and the roots will have to be chopped. Sometimes when the hole is being dug a large root will be struck. Where it is impossible to chop this, to save starting all over again a stick of powder, or sometimes half a stick, should be put in the hole alongside the root and fired. This will cut the root and blow a hole sufficiently big to allow of its being finished with a shovel. To avoid

miss-fires, which are often very dangerous, it is best, after inserting the cap in the stick of powder to be used as the primer, to double the fuse round the end of cartridge and tie it securely, putting in the priming cartridge-cap end first. This prevents the fuse being pulled out during the process of tamping. (See Fig. 8.)

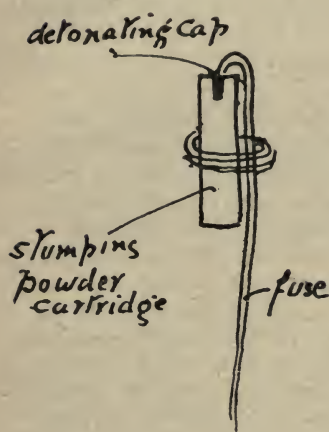
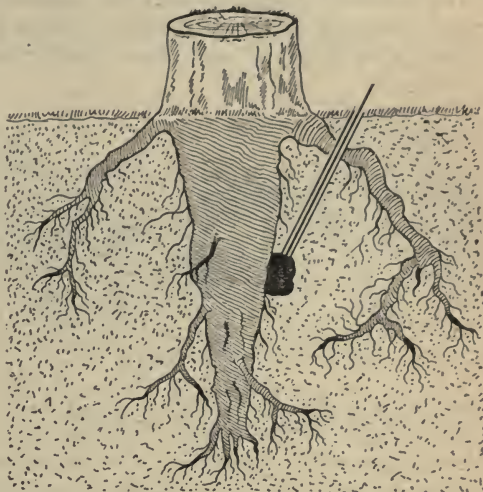


FIGURE 8



This picture shows the correct placing of the charge where the stump has a tap-root. The root will be broken off at sufficient depth to admit of the use of a plough.

The powder most generally used is 20-per-cent. nitro-glycerine, commonly known as stumping-powder, which can be got at reduced rates through the various Farmers' Institutes, which are linked up with the Provincial Department of Agriculture.

The tools required are a 2-inch auger about 4 feet long and a 4-inch auger 5 feet long, an ordinary long-handled shovel, and a long-handled spade which has been bent round like a section of a pipe (Fig. 9), also a nipper for attaching the cap to the fuse. If stumping-powder is used,

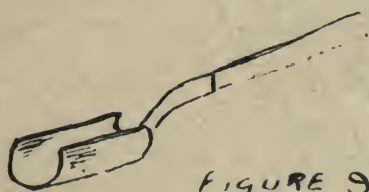


FIGURE 9

in the spring particularly, it is often frozen. Great care should be exercised in thawing it. The sticks may be left in the sun, on the barn-roof or some other sunny place, or, what is better still, the box may be put in the horse-manure pile overnight. The hole in the cartridge in which the cap is inserted should be made with a pointed stick, not with a piece of metal.

If the settler is not used to handling powder, it is better for him to get a neighbour who understands it to help him, as an accident never happens twice to the same person. If several blasts are being set off at about the same time, do not leave the vicinity until they have been counted and be quite sure they have all gone off before returning. If for any reason one has missed fire, leave it for a while and give it every chance, and when you do go back the best way is to start another hole and put in another charge, as to dig out an exploded charge is a very dangerous operation.

STUMPING WITH SMALL BLASTS.

There is another system of taking out the large old-growth stumps which, although not so popular as the big-blast method, is really more economical if the settler does not put a very high value on his own time, but it can only be followed out if the stumping is undertaken before the big logs and other fairly large debris

has been got rid of. It also necessitates the work of two men; at least, two men can do it to very much better advantage than one. Although less costly as regards actual outlay of money, on account of the very much smaller amount of powder used, it is rather slower. The system is as follows:—

Instead of using a big charge of powder—often as much as a whole box (50 lb.)—as is necessary under the system described above, a very much smaller charge is used, approximately about a fifth to a seventh of 50 lb. It is impossible to lay down

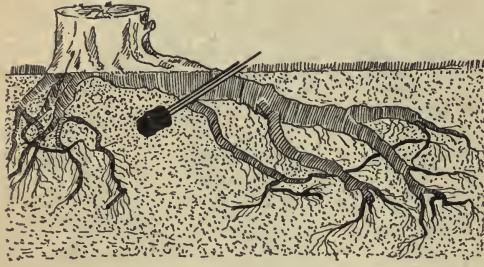


Illustration showing position of charge under stump with no tap-root. Most of the trees in the Coast region of British Columbia are of this type.

any fixed figures for this; experience alone can determine. A deep hole is put underneath the stump—as deep as it can be got—in the same way as that previously described. After the shot has gone off none of the stump is blown out, but all of it is lifted perhaps 6 to 12 inches and the ground slightly heaved. The top of the stump will have been split into four or more portions and will lean outwards, making open forks of the upper part of the stump (see Fig. 10), and the dirt will have been



FIGURE 10.

blown clear from the centre. Into the forks of the stump are piled up all the logs and loose roots and rubbish within easy reach so as to make a big fire. Do not be afraid to make a big one. While this is burning the various roots leading from the stump are traced down, and at about two-thirds of the length (anything from 10 to 20 feet from the stump, depending upon its size) the root is uncovered and is chopped through. This procedure is followed with all the roots which can be got at. By the time this is done the heart of the stump will have burned itself out. A long pry or pole, as big as two men can handle, is then procured. This is inserted underneath the chopped-off root and the end where it was chopped pried up so that the split portions of the stump, separated by the

is not, as a rule, a very big undertaking, as very often they turn down into the ground and can be cut off a foot or two below the surface.

All this sounds more complicated than it really is. Two men can generally get rid of an old-growth fir stump by this means in one or, at most, two days, with a very small expenditure of powder. If the settler has a team a good deal of the digging and chopping can be done away with, and these roots pulled out with a team can be pulled around in such a way that they will pry out without too much muscular exertion.



FIGURE II.

The use of a team in stumping almost invariably necessitates the use also of blocks and tackle. It would be impossible in the limits imposed by this pamphlet to give any useful description of this class of work. The use of blocks and wire cable—or tackle, as it is commonly called—in connection with stumping operations in the hands of a really skilled man is a very good way indeed of getting stumps out quickly, cheaply, and with much less hard work than if the stumping is done by any of the methods mentioned before; but unless the settler really is skilled in this particular work he had better leave it alone and hitch his team on to nothing which they cannot pull out with a straight pull. To a man who really is skilled in the use of blocks any description in this pamphlet would be quite superfluous.

Taking out old-growth cedar stumps, particularly the very large hollow ones, is a somewhat different business. It is impossible to take them out with one large blast when they are hollow. The only way to do is to put a stick or even half a stick, of powder in some suitable place and blast an opening in the outer shell or crack some of it up. These roots, as a rule, will not go very deep, and when the outer shell is once cracked up they can either be pulled out with a team or dug out by hand.

SECOND-GROWTH STUMPS.

The above has been written more particularly with reference to old-growth stumps. As regards the second-growth stumps, the largest of which will rarely exceed 2 feet 6 inches in diameter, with very few attaining that size, these must also be got rid of before the land can be ploughed to advantage. The smaller ones can be got out most cheaply by uncovering one or two of the main roots, chopping them off below the surface of the ground, and then pulling them out with a team; but when they are over 18 inches or 2 feet in diameter the best way is to put an auger-hole 3 or 4 feet deep right under the centre of the stump and use sufficient powder to lift up the whole stump. The hole should be made deep enough, the deeper the better. When these stumps are once out they are not too large for a team to handle conveniently. Approximately about 1 lb. of powder to each foot in diameter of the stump is usually enough in clay ground, but in sandy or gravelly ground about 50 per cent. more is required, and this only applies to stumps which have been cut for some time. A newly cut stump would probably want double the amount of powder. This does not apply, either, to old-growth stumps, which if they are going to be blasted out completely in one operation require considerably more than that. The amount required for them will vary from half a box to a box of

powder. It is better to use a little too much than a little too little in the case of these old-growth stumps, because partly blasted they are often worse to handle than if they had never been blasted at all, whereas a smaller stump partly blasted can be pulled out with a team and a little chopping.

After the timber has been cut four years most of the stumps of from 12 to 18 inches in diameter will be sufficiently rotted to be taken out with grab-hooks and chain and a team, without the use of powder at all and without much chopping or digging. The stumps of deciduous trees, such as alder, maple, etc., should in four years' time be so rotted that stumping operations of any kind will hardly be needed, except for the larger ones. Many of them will plough out, and the biggest should easily be pulled out with a team.

STUMPING-MACHINES.

The taking-out of stumps with machinery is a very popular thing in the public mind, and hand and horse-power machines have improved very much in recent years. The writer's experience, however, is that many of the machines which have been so much advertised in the past are more suited for conditions in districts where the timber is not anywhere nearly so heavy as it is in most parts of this Province, particularly in the Lower Fraser Valley.

The horse-power machines may roughly be divided into two classes—those with the vertical drum and those with the horizontal drum. The writer much prefers those with the horizontal drum. The vertical drum does good work, but it has one serious defect, in that the cable, which is a sort of spring-steel, is apt to unreel on the drum and fall off. There are devices for preventing this, but it is always more or less a source of annoyance and delay. The horizontal-drum stumping-machines are built more or less on the lines of a small donkey-engine. If the settler is going in for this kind of stumping-machinery he had better get the best, and it is a good idea for two or three people to join in the procuring of one machine, as the machines are rather expensive, and in any case require several men to handle them to advantage. They are generally used where the timber has not been cut any great length of time and the stumps are still green. It should always be remembered in this connection that there are two operations in connection with the getting rid of a stump—one to get it out of the ground and the other to get rid of it once it is out, and the latter is often the bigger job. Some of the horizontal-drum machines are fitted with two speeds—one a slow speed for pulling out the stump and the other a higher speed for dragging the stump or a log over the ground to the place where it is going to be burned. The cable and tackle generally connected with a stumping-machine of this size are naturally all heavier and bigger than similar cables, blocks, etc., would be if used with horses without the stumping-machine. Moving these blocks and the cable about is a very heavy business, and the use of the blocks should be avoided as much as possible, as they take so long to fix and get ready, to say nothing of the constant moving. It is far better to use a pound or two more powder than to economize on the powder and spend the time in moving blocks and fixing tackle. It is not, however, advisable for any one to go in for these large two-speed stumping-machines unless he has some previous knowledge of their handling; otherwise there is liable to be a great deal of lost time and ineffective work; but a small, well-drilled crew, "thoroughly on to their job," can do very effective work, particularly if the stumping-machine is geared or belted to a gasoline-engine.

ONE-MAN STUMPING-MACHINE.

Within recent years there have been developed two or three makes of what are known as one-man stumping-machines, and these are a very effective instrument in the hands of a man who is willing to spend a little time in thoroughly mastering them. They will save a great deal of hard work and also a considerable amount of

powder, and are particularly useful on land on which the timber has not been cut down very long and the stumps are comparatively green. However, before anybody invests money in any kind of stumping-machine it will be advisable for him to spend a few days, or even a week or two in going round and watching somebody else use the same machine. The satisfactory and economical use of any kind of machinery means a certain amount of mechanical ability on the part of the man who is going to use it, and unless he has this mechanical ability he had far better keep away from any kind of machinery at all and depend upon powder, an axe, a shovel, and a saw.

THE ACID OR DOPE METHOD OF STUMPING.

For the last thirty years, and probably longer, there have been, generally in the Sunday editions of the daily papers, although occasionally in the more widely read weeklies, accounts of some wonderful new method of taking out stumps with some kind of acid or mysterious preparation which is supposed to make a stump particularly easy to burn, without the usual more or less laborious method of taking out the stump first. About every three or four years there is an epidemic of these newspaper articles. They generally come out in the slack season in newspaper offices. It is a strange thing that, although these systems of taking out stumps at a nominal cost have been continually brought before the public for so many years, none of them seem to have come into general use, and it is just as well to issue a word of warning to the settler against spending either money or time in experimenting on these lines. If there was anything in it, there is no doubt that some of the many agricultural associations, governmental and otherwise, would have taken this system up long ago. As a matter of fact, in many parts of this Province certain kinds of stumps can be burned out completely without any "dope preparation" or "stumping" in the ordinary sense of the word. This is more particularly the case in the dry and semi-dry districts, but in the Lower Fraser and on the Coast, where the land-clearing problem is of real importance, the ground a few inches below the surface is always so moist that the wood-fibre of the stump never really dries out, and until it is dried out it is obviously impossible to burn it. No acid or dope preparation can forcibly eject this water in the wood-fibre of the stump. The natural juices of the wood are only circulating while the tree is living. When it is dead (like the blood in the human body) they cease to circulate, and unless the moisture in the stump can in some way be got rid of it is obvious that it could not be replaced by any of these dope preparations—acid or anything else. In the writer's rather long experience of clearing land he has never come across any instance of any of these acid systems of getting rid of stumps having been tried successfully, or even with partial success.

COST OF CLEARING.

In the previous edition of this pamphlet estimates were given of the costs of the various operations of clearing land—chopping, burning, branding-up, logging, stumping, and so forth. These estimates were made over twelve years ago and are entirely out of date now. Comparatively little contract-work has been done in recent years—since the great rise in wages occurred—so that it would not be safe to make any estimates of the costs now. The writer, however, has cleared up a good many hundreds of acres of average-timbered land in the Lower Fraser Valley, and some of it in years gone by has been put in cultivation at as low a figure as \$50 an acre. The same land to-day, if the work were done by either contract or day-work, would probably cost \$200 an acre and sometimes more to clear; but any settler who is taking hold of a piece of bush land cannot take into consideration the present scale of wages, as a great deal of the work of clearing is done in his spare time and between seasons. It was a usual thing some years ago to contract for the taking-out of large old-growth cedar stumps at from \$1.50 to \$2.50 each. The work was done with teams and blocks and tackle, with practically no powder. At that time a man and team were worth \$5 a day and a man without a team \$2 a day. This work was

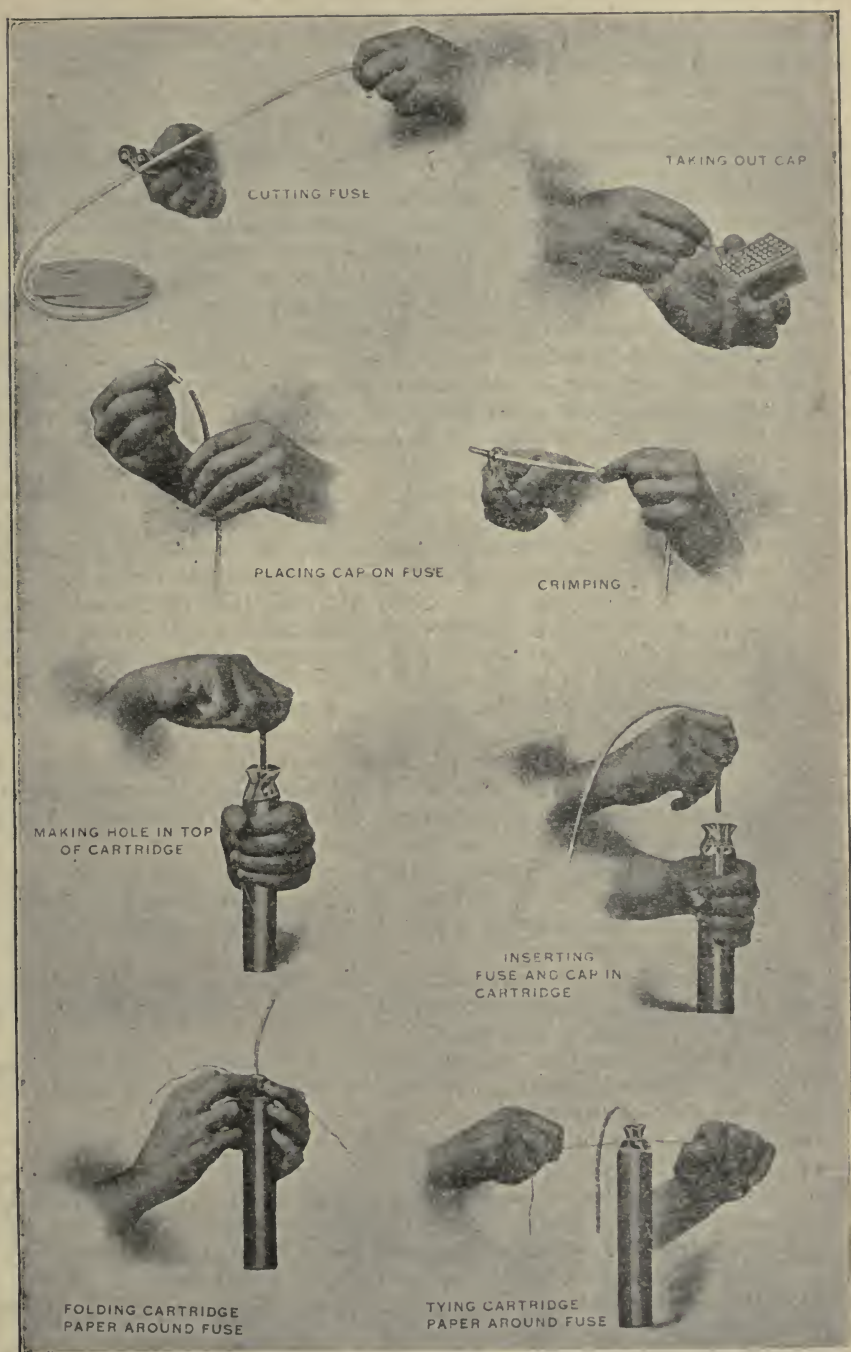
done with two men and a team and the stumps were dead. Of course, to take out green stumps it would have cost a good deal more.

The various operations of clearing have been described in such detail that, at first sight, it will appear to be a very much bigger and more expensive undertaking than it is in reality. Leaving out the cost of taking out the big stumps, which is not essential and is usually considered a "frilling," it is astonishing how small the cost actually is. The bulk of the work is done by the farmer himself, in spare time between seeding and harvest, or in winter. He also, in many cases, makes a profit on the cordwood, or, at least, good wages; besides which, the farm becomes remunerative as pasture land after the first year.

In estimating costs no account is taken of the underdraining, as on the average timber land there is so little of it required. Where there is any considerable amount the cost, as a rule, is far more than offset by there being much less stumping to do.

This land-clearing, though not costly, is a rather slow business at first, but the farmer has the satisfaction of seeing his farm gradually grow from the forest to the field; he feels that he himself has made all these rough places smooth, and although taking out the big stumps is usually the work left to the last, there is no part of the clearing operations so thoroughly satisfactory. This is the finishing touch; the stump once out is out for ever.

No doubt there will be many old hands at land-clearing who will think of the number of ways they could do it better, and others again who would say that it would be impossible to follow out exactly the instructions given. The system outlined is by no means perfect, and is only intended as a general guide to the beginner, and no doubt in practice many variations may be necessary; but the amateur of to-day is the expert of to-morrow, and experience will, without question, suggest many improvements. The cost, however, if the work is done systematically, is nowhere near what is generally supposed.



Priming a dynamite cartridge in the end.

APPENDIX.

EXTRACT FROM THE "TRESPASS ACT AMENDMENT ACT, 1919."

3. (1.) A lawful fence for the purpose of dividing the right-of-way, grounds, or property of a railway company to which the "British Columbia Railway Act" applies from any other land, whether belonging to the railway company or not, or for the purpose of protecting any stack of hay or grain, means a fence substantially constructed from the ground to a height of at least four feet six inches, and consisting:—

- (a.) Of earth, stone, brick, concrete, or iron; or
- (b.) Of logs, rails, boards, or bars of wood or iron, laid horizontally one above the other not more than six inches apart up to a height of three feet from the ground, and not more than twelve inches apart above that height; the bottom of the lowest log, rail, board, or bar being at any point not more than six inches from the ground; or
- (c.) Of upright posts, boards, palings, or pickets not more than four inches apart; or
- (d.) Of wire of a standard gauge not less than No. 9 or of barbed wire not less than No. 12 gauge, secured to posts not more than twenty feet apart, the lowest wire being at any point not more than six inches from the ground, the wires being not more than six inches apart up to a height of three feet from the ground, and not more than twelve inches apart above that height, being interlaced with cross-wiring or fastened to wooden droppers or poles placed at regular intervals of not more than four feet; or
- (e.) Of woven standard-gauge wire fencing secured to posts not more than twenty-four feet apart, with the lowest wire not more than six inches above the ground, the top and bottom wires to be not less than No. 9 gauge, and intervening wires not less than No. 12 gauge; or
- (f.) Of a combination of the materials specified in any two or more of the foregoing clauses (a) to (e); but where any combination includes wire or barbed wire the provisions of clause (d) as to cross-wiring, droppers, or poles shall be observed.

(2.) For the purpose of protecting any stack of hay or grain by any fence specified in subsection (1), the distance shall not be less than ten feet from the nearest point of the fence to such stack.

(3.) In all cases other than those provided for in subsection (1) a lawful fence means a fence substantially constructed from the ground to height of at least four feet six inches, and consisting:—

- (a.) Of earth, stone, brick, concrete, or iron; or
- (b.) Of logs, rails, boards, or bars of wood or iron, laid horizontally one above the other not more than nine inches apart up to a height of thirty-two inches from the ground, and not more than eleven inches apart above that height; the bottom of the lowest log, rail, board, or bar being at any point not more than fourteen inches from the ground; or
- (c.) Of upright posts, boards, palings, or pickets not more than four inches apart; or
- (d.) Of wire of a standard gauge not less than No. 9, secured to posts not more than twenty-four feet apart, the lowest wire being at any point not more than fourteen inches from the ground, the wires being not more than nine inches apart up to a height of thirty-two inches from the ground, and

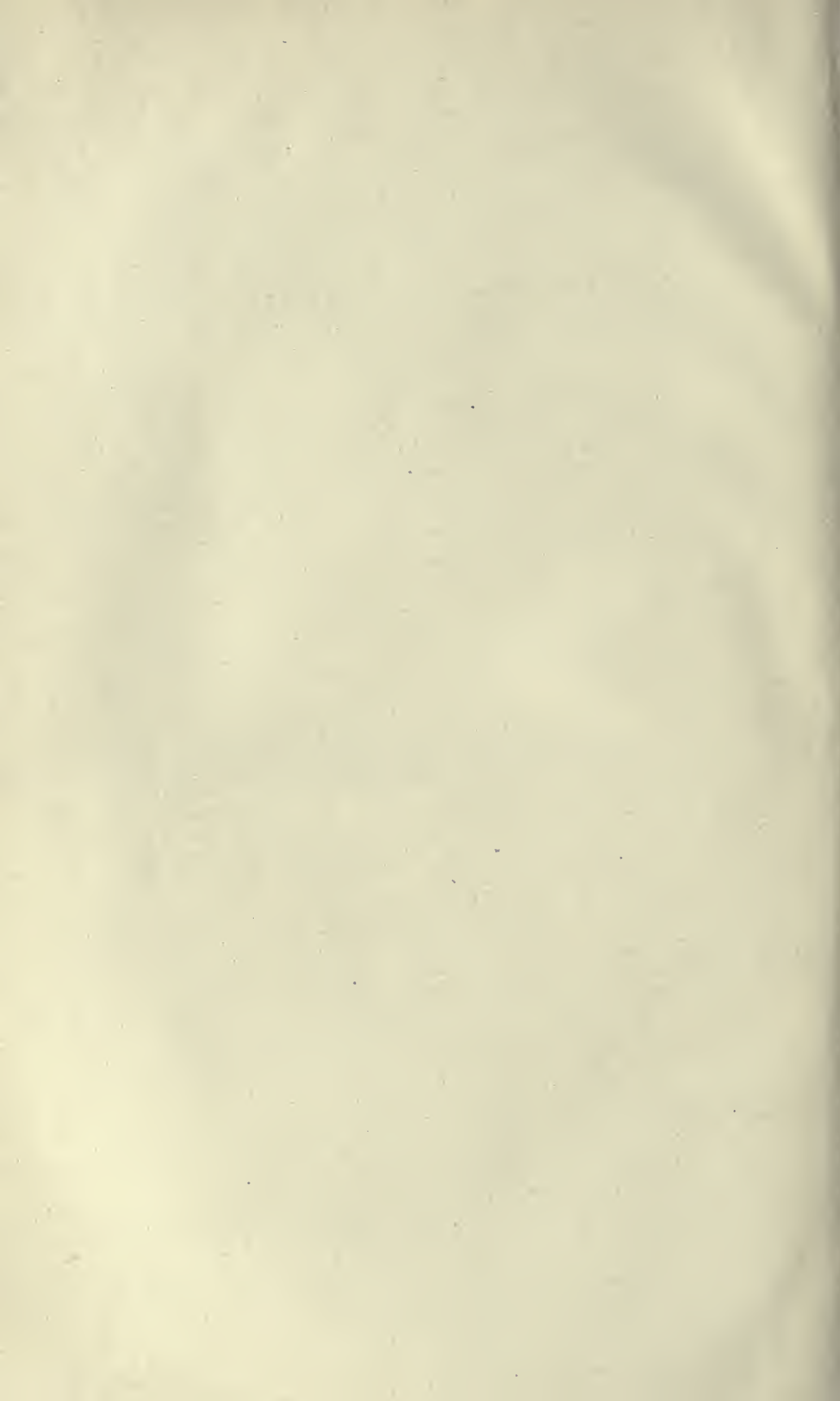
not more than eleven inches apart above that height, and being interlaced with cross-wiring or fastened to wooden droppers or poles placed at regular intervals of not more than four feet; or

- (e.) Of woven standard-gauge wire fencing secured to posts not more than twenty-four feet apart, with lowest wire not more than fourteen inches above the ground, the top and bottom wires to be not less than No. 9 gauge, and intervening wires not less than No. 12 gauge; or
- (f.) Of barbed wire not less than No. 12 gauge, and secured to posts not more than twenty-four feet apart, the lowest wire being not more than fourteen inches from the ground, the wires being not more than nine inches apart up to a height of thirty-two inches from the ground, and not more than eleven inches apart above that height, and being interlaced with cross-wiring or fastened to wooden droppers or poles placed at regular intervals of not more than six feet; or
- (g.) Of a combination of the materials specified in any two or more of the foregoing clauses (a) to (f); but where any combination includes wire or barbed wire the provisions as to cross-wiring, droppers, or poles shall be observed, and the spacing of the cross-wiring, droppers, or poles shall not be more than the minimum spacing provided for wire of the character used in the combination.

(4.) Any hedge of the height of at least four feet six inches, and any river bank or other natural boundary, if sufficient to keep cattle out of any land, and any unfordable lake, pond, river, or sea, shall be deemed to be a lawful fence.

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